Material Process Parameters

Mazak Optonics Corp.

Super Turbo-X Mark III
4000W
(X44/X48/X510)
Servo & IMS
Version 2.2.0512

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Using This Manual

This manual contains the material process parameters for cutting a vast array of material types and thicknesses on your Mazak *STX Mark III* 4000-watt laser system. This data is provided as a starting guide, as it is not uncommon for values to vary slightly due to changes in material composition and levels of machine maintenance. Within this manual, you will find cutting parameters, sample program codes and programming suggestions for each of the material types and thicknesses.

Material Cut Charts

The *STX Mark III* can be installed as a single stand-alone machine or in an automated system with material handling (*FMS*). Machines installed in automated system are intended to have minimal operator intervention. Therefore, this manual contains a data collection specifically developed to process materials without the need for manual setup changes. Since the *STX Mark III* machine is equipped with a nozzle changer within the *Opt-i-Pod*, this configuration operates with a 7.5" lens and either a 1.5mm, 2mm or 3mm nozzle tip, depending on the application. This data collection is referred to as the ***FMS Data Set***. Operating the machine in this configuration may result in a slight reduction in processing speeds, but the system can be run continuously with little or no operator supervision.

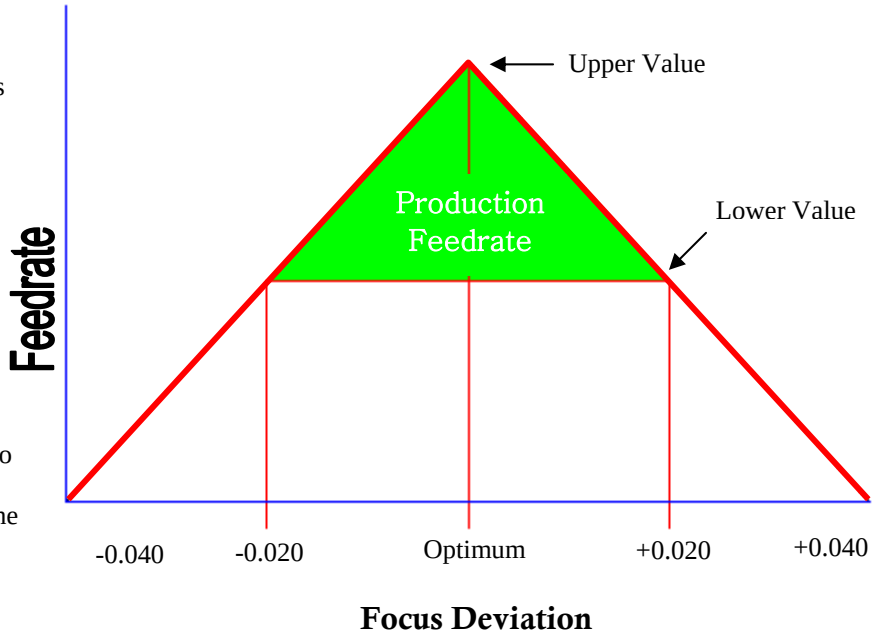
To operate the *STX Mark III* with optimum efficiency, different focus lens and nozzle tip configurations will need to be used depending on the material type and thickness currently being processed. This may require an operator to make manual adjustments to the machine setup when switching between various materials. This manual also contains a data collection specifically developed to run the machine under optimum conditions. The collection is referred to as the ***Optimum Data Set***. This data set utilizes both the 5.0-inch and 7.5-inch focus lenses and many different nozzle tip configurations.

Cutting Condition Sub Programs

The back cover of this manual contains a CD with all the cut conditions sub programs described in the material charts. There are two folders on the CD. One folder contains the *FMS Data Set* and the other contains the Optimum Data Set. Upon installation, the sub programs will be installed in the machine based on the desired mode of operation.

Feedrate Ranges

The feedrate stated in the cutting tables is listed as a range. The upper number represents the maximum feedrate obtainable for a given material. Operating the machine at this feedrate offers little room for error in setting the focus position. *(as seen in the graphic to the right)* Operating at the lower value offers a greater variance in focus settings, and allows for deviations in material quality, machine setup, lens condition, and operator experience. It is reasonable to expect to process any given material somewhere within the range listed in the charts, based on the previously listed conditions. The sub programs loaded into the machine are set to the lower value. As the operator becomes comfortable with the machine, these values can be increased



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Servo Focus Torch

The *STX Mark III* is equipped with a *Servo-Focus* torch. The Servo-Focus torch is different than the standard auto-focus cutting head in that adjustment of the focus lens position is servo controlled. **Figure 1** shows the Servo-Focus torch installed on the machine. A small ball screw and motor are used to move the lens through G-code commands. This allows the operator to adjust the position of the focus lens at anytime during the cutting process. This flexibility allows for different focus settings for piercing and cutting, as well as the ability to drive the focus down through the material during the piercing process.

Figure 1 Servo-Focus Torch

The lens position inside the Servo-Focus torch is controlled by a *G00* or *G01* command. The *G00* (rapid travel) command will be used in most cases to move the lens. This command moves the lens at its maximum speed, resulting in a near instantaneous position change. This approach is used for setting the initial lens position, or transitioning between the piercing and cutting focus settings.

Another method of moving the focus lens is through the *G01* (linear travel) command. The *G01* approach to moving the lens must be accompanied by a Feedrate command. The *G01* command is used mainly when piercing thick mild steel, where the pierce times are generally longer than one second. When used for piercing, this command drives the focus spot down through the material at a specified rate. The result is similar to a drilling motion, producing much faster pierce times.

Servo Focus Control Examples:

G90G00W-0.100 (Rapid travel adjustment to a setting of -0.100” below nozzle)

G90G01W-0.250F20.0 (Moves the lens to a position of -0.250” below the nozzle at 20 ipm)

Nozzles

With the Servo-Focus torch, there are 2 different nozzle styles available to choose from. The standard recommended nozzle for most applications has a long narrow or *Slim* profile. The alternative to Slim nozzle is the *Side Blow* nozzle. The Side Blow nozzle has a much shorter and wider profile. **Figure 2** shows a comparison of the two styles of nozzles. The Side Blow nozzle is optional and is only used in thick plate applications where the side blow piercing technique is used.

Figure 2 Slim vs. Side Blow nozzle

Each of the two nozzle styles is available in multiple orifice sizes. The size of the orifice is determined by the material being processed. In addition to multiple orifice sizes, each nozzle style is available in two different nozzle types. There is a standard straight bore nozzle and what is called a *Double* nozzle. The Double nozzle is only used for thick mild steel (oxygen assist) applications. To distinguish the difference between the two types of nozzles, look for the additional vent opening on the threaded end of the nozzle. **Figure 3** shows the difference between the standard and the Double nozzle.

Figure 3 Double vs. Standard nozzle

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Single Step Servo Pierce

Most materials will use a single step servo pierce. This type of pierce sets a focus position at the beginning of the piercing sub program with a *G00* rapid travel command. This is used on thin mild steel and most nitrogen applications. The pierce time for these materials is typically only a few tenths of a second with no focus change between piercing and cutting. **Figure 2** shows a single step servo pierce for 16ga mild steel.

```
O5040 (MS060 Pierce)
G90G00W-0.040        <-- Focus Adjustment
G88P10M56
G87P10
M32
G82P1300Q30R20
M20
M22
G04X0.1
M99
```

Figure 4 Single Step Servo Pierce

```
O5750 (MS750 PIERCE)
G90G00W-0.280
G88P3M56
G87P60               <-- Step 1
M32
G82P4000Q5R25
M20
M22
G04X1.0              <-- Step 2
G87P30
G88P6M56
G82P4000Q90R30
G90G01W-.500F3.0
G90G00W0.02 (CUT FOCUS)
G82P4000Q500R100
G04X0.2              <-- Step 3
M99
```

Figure 5 Multi-Step Servo Pierce

Multi-Step Servo Pierce

Multi-Step servo piercing is used on thick mild steel applications between 5/16" and 1-inch. The process consists of three steps. The first step involves starting the pierce with a high nozzle gap at the initial lens position for a short duration. The second step drops to a lower nozzle gap, changes the piercing power and drives the lens down toward the material at a controlled feedrate. The pierce should break through the bottom of the material at or before the conclusion of the second step. The Third step cleans out the hole with a short full power burst and moves the lens to the position required for cutting. **Figure 3** shows an example of a Multi-step servo pierce for ¾" mild steel

Side Blow Pierce

Side Blow Piercing or sometimes called Fast piercing, is a thick mild steel plate technique. This method produces a larger pierce hole, which usually only takes a few seconds. This technique is not use as often because the Multi-Step Servo pierce produces a cleaner hole in about the same amount of time. The one exception is 1.0-inch mild steel. This technique is accomplished by raising the nozzle to a high gap and turning on full power, blasting a hole in the material. This produces molten metal on the surface, which may stick to the top surface of the material. To clear the area of this debris, the Side Blow piercing option allows for an automated control of an anti-spatter spray nozzle and a high-pressure air blast to keep debris away from the cutting area. **Figure 4** shows an example of a Side Blow pierce for 1.0-inch material.

The process parameter table for each material will specify which piercing techniques apply, and how to implement them.

```
O5999 (MS1000 Side Blow)
G90G00W-0.100
G87P60
M32
G88P8M56
M31                  <-- Anti-Spatter Mist
M66
G04X0.4
M65
G82P4000Q75R95       <-- Create Pierce Hole
M22
G04X3.0
M23
M60
G04X2.0              <-- Air Blast
M61
M22
M32
G90G00W0.020 (Cut Focus)
M99
```

Figure 4 Side Blow Pierce

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Lead-in Lines

Each material chart specifies a minimum lead-in length. The length of the lead-in depends on the type of piercing technique and assist gas used. When using nitrogen as an assist gas, pierce spatter consisting of thin metal slivers are sprayed around the pierce hole. These slivers cause the nozzle to jump up and down while cutting through them on the way to the edge of the contour. Longer lead-ins will allow the cutting process to equalize before the cut reaches the programmed geometry. **Figure 5** shows the spatter from a nitrogen pierce.

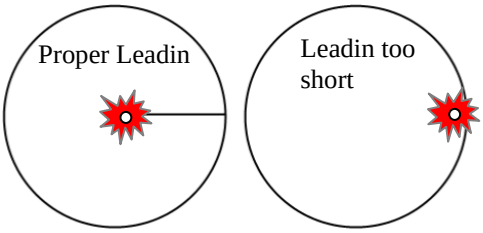

Figure 5 Pierce Spatter from N2

Using the Side Blow pierce (fast) technique also requires a longer lead-in. The diameter of the pierce hole becomes larger as the material thickness increases. This technique can be used on mild steel 3/16 inch and thicker, but is mostly use on 1.0-inch plate. The diameter of the pierce hole can be as large as 1/4 inch on the thickest material. **Figure 6** shows the preferred lead-in when using the side blow pierce.

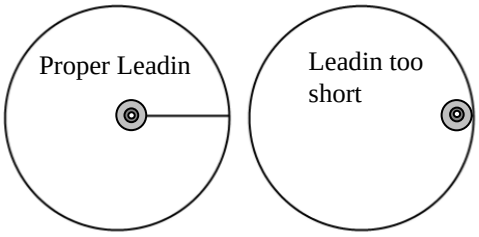

Figure 6 *Side Blow Pierce hole Diameter*

Most materials can be processed using a straight 90-degree lead-in. To improve the quality of the lead-in transition, an arced lead-in can be used. This will minimize the bead of dross that is often left at this junction when processing material with nitrogen. A 0.060-inch radius works well for this application. **Figure 7** shows and arc style lead-in. **Note: When using a line/arc lead-in, cutter compensation must be established on the straight section of the lead-in.**

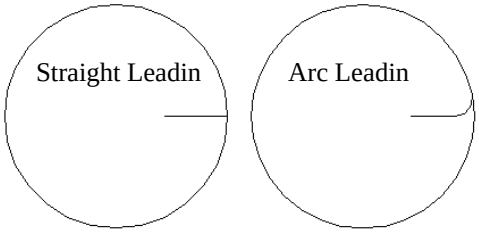

Figure 7 Arc Leadin Technique

Double Cut Lead-in Lines

Double Cut lead-ins or sometimes called, *Back-and-Forth* lead-ins, are used on thick mild steel 3/8 inch and greater. This technique is usually combined with Side Blow Piercing, and is used to increase the consistency of the start of the cut. After the pierce, a portion of the lead-in *(usually 80%)* is cut with a low frequency, low duty cycle, slow feedrate condition. This cut opens the kerf and clears a path through the debris left from the Side Blow Pierce. Once this preliminary cut has been completed, the nozzle returns to the center of the pierce hole. Since the kerf is now clear of any debris, the fast contouring condition can now be used to cut the entire lead-in and continue on to the programmed geometry. Without this start of cut method, there is an increased chance of leaving a small weld at the lead-in transition to the part contour. See **Figure 8** for an example of implementing this technique.

```
M98P9001              (Laser off)
G00 X3.5 Y5.0         (Rapid to pierce point)
M98P5500              (Side blow pierce)
M98P5506              (Pulsed lead-in)
G01 X3.95 Y5.0        (Cut lead-in with pulse conditions)
M23                   (Beam off)
G00 X3.5 Y5.0         (Rapid move back to pierce point)
M98P5501              (Laser on fast contour conditions)
G42 G01 X4.0 Y5.0 D1  (Re-cut lead-in with fast cut)
G02 I-.5              (Cut contour)
G40 G01
M98P9001              (Laser off)
G00 X7.5 Y5.0         (Rapid to the next feature)
```

Figure 8 Double Cut Lead-in Example

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Accelerated Lead-in Lines

The Accelerated lead-in technique is used when processing mid to thick nitrogen applications. This lead-in method uses two cutting condition sub programs to complete a feature. The first sub program pierces through the material. The next sub program sets the cut conditions which will be used for the lead-in. The third sub program sets the conditions which will be used to process the feature. The conditions used on the lead-in usually specify a higher nozzle gap, full power, and reduced feedrate and gas pressure. After cutting the lead-in line, the contouring parameters then switch to a higher gas pressure and feedrate. This technique helps the consistency of the start of cut. This technique is absolutely necessary when processing the stainless and aluminum close to the maximum machine capacity. Without it, welding will occur at the start of the cut. **Figure 9** is an example of how to implement an accelerated lead-in.

```
N2
G00G90X0.996Y0.812
M98P8250                (Pierce)
M98P8256                (Slow Lead-in condition)
G90G01X1.1512Y0.8087    (Cut 80% of Lead-in)
M98P8251                (Fast Cut condition)
G42G01X1.19Y0.8079D01   (Cut remaining 20% of Lead-in)
G02I-0.198              (Cut Feature)
G01G40
M98P9001
N3
G00G90X4.5026Y0.8096
```

Figure 9 Accelerated lead-in example

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Cooling Dwells

Cooling dwells are a technique used in mild steel applications where poor cutting results when processing sharp intersections. These intersections may occur at the lead-in transition or at other points throughout the programmed geometry. This technique is implemented by turning off the laser beam for a brief moment before exiting the sharp transition. While the laser beam is off, the assist gas remains on, cooling the material. Signs that a cooling dwell is needed would be welding at a sharp intersection, or an extra wide kerf width upon exiting the corner. **Figure 10** shows potential problems areas where a cooling dwell could be needed. **Figure 11** shows the necessary code for implementing a cooling dwell.

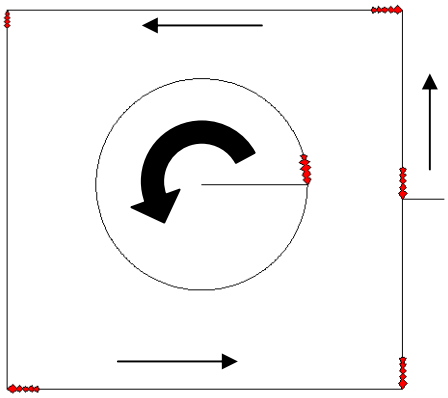

Figure 10 Cooling dwell areas

(Square without cooling dwells)	(Square cut with cooling dwells)
G90 G92 X0 Y0	G90 G92 X0 Y0
M20	M20
M98P5060	M98P5060
M98P5061	M98P5061
G01 X3.0 Y0	G01 X3.0 Y0
G01 X3.0 Y3.0	M23
G01 X0 Y3.0	G04X0.5
G01 X0 Y0	M22
M98P9001	G01 X3.0 Y3.0
M30	M23
	G04X0.5
	M22
	G01 X0 Y3.0
	M23
	G04X0.5
	M22
	G01 X0 Y0
	M98P9001

Cooling Dwell

Figure 11 Cooling dwell sample code

Corner Radius

A corner radius is an alternate programming technique which can be used in place of an exact stop or corner cooling dwell. In thicker mild steel (*oxygen assist*) applications, a corner radius can be used in place of a cooling dwell to prevent over burning on sharp corners. A radius value equal to or larger than $1/10^{th}$ the material thickness, should negate the need for a corner cooling dwell. In the case of high speed applications, a corner radius can be used instead of an exact stop to prevent corner rounding due to excess corner speed. The radius will force the machine to slow down and follow the programmed path, rather than allow momentum to randomly round the corner. In addition, the machine will process a programmed radius faster than an exact stop command, resulting in faster part times. If the radius is small enough (0.015” – 0.020”) it may not even be visually noticeable.

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Using Exact Stops

An exact stop is a G-code, *(G09 or G61)* which causes the cutting head to momentarily pause at a given intersection. This programming code is necessary for applications that specify a high cutting feedrate. If an exact stop is not used the momentum of the drives will be carried into the corner and a radius will occur instead of a sharp intersection. The severity of the radius is directly related to the cutting feedrate. If the feedrate is slow enough, the radius may not even be detectable. In high feedrate applications, the radius will be noticeable. The radius will also be seen on lead-in lines, resulting in features being left tabbed in the part. Placing a *G09* statement on the lead-in line will fix this problem.
See **Figure 12** for a graphic display of the effects of using exact stops.

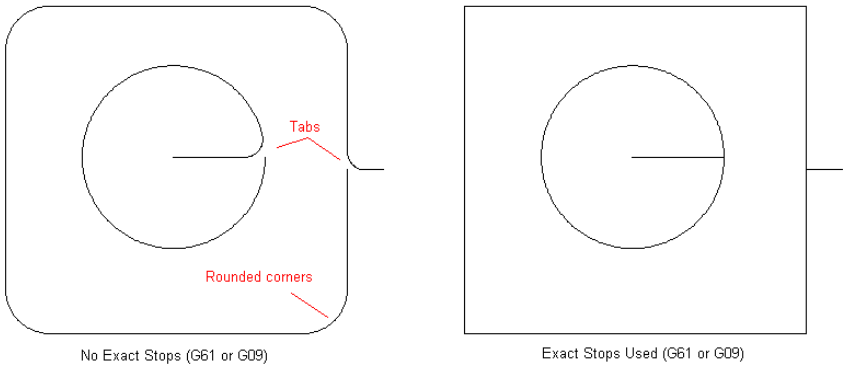

Figure 12 Exact Stop Examples

Programmed Feedrates

The material parameter charts contain 3 feedrate options for each material. The medium and slow feedrate data should be used for small or intricate geometries. In the case where small holes are out of tolerance, try changing the cut conditions for that feature to a slower setting. Heat management is also another case where the fastest condition may not produce the best quality parts. Hole diameters equal to the material thickness *(or smaller)* may melt the slug before the feature has been completely cut. When this occurs, switching to a slower, lower heat condition will help preserve the integrity of the slug producing a quality cut.

Marking or Etching

It is possible etch bend lines or text on the parts that are cut on the machine. This is accomplished by decreasing the power output of the laser down to a point where the beam simply marks a line on the steel. The type of assist gas used for this process *(oxygen, nitrogen, air)* produces different results when used for etching. Oxygen produces a black etch line; nitrogen produces a silver etch line; and air produces a something in between. Cutting with one assist gas and etching with a different gas can be accomplished on the same part, but measures need to be taken to purge the gas lines when switching from cutting to etching. Etching with the same gas used for cutting is the recommended method, although it is not required.
See **Figure 13** for sample etching sub programs.

(Oxygen etching sample code)	(Nitrogen etching sample code)	(Air etching sample code)
O101	O103	O102
G82P500Q125R5F75	G82P1200Q300R7F75	G82P800Q300R7F75
G88P10M56	G88P10M58	G88P10M57
G87P20	G87P20	G87P20
M32	M32	M32
M20	M20	M20
M22	M22	M22
M99	M99	M99

Figure 13 Sample code for etching

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G22 Command

The G22 command controls the automatic setup functions of the STX-Mark III. These functions tell the machine what material and thickness is being processed in addition to what focus setting, lens, and nozzle to be used. The G22 command also controls the functions of the Opt-i-Pod which includes Blue Flame calibration, nozzle grinder, and height sensor calibration. This section will explain how to use each one of these functions.

The G22 command functions can be broken down into two groups, those pertaining to material setup, and those for machine calibration and maintenance. The setup functions must be commanded at the beginning of every program, while the others are only used periodically. The periodic functions include Blue Flame and height sensor calibration, and nozzle grinding.

Every program must contain a G22 command at the top of the program with specifies the following: material type, material thickness, focus lens, nozzle orifice, nozzle type, and focus setting. Below you will find a sample G22 statement with explanations of each variable. Execution of this command may cause the cutting head to access the Opt-i-Pod if needed.

G22 I2 J0.250 T7.5 Z3.0 W2 U-0.150

I = Material Type, (1: mild steel, 2: stainless steel, 3: aluminum)

> **Note:** For material types other than the three listed here, use the assist gas as a guide for choosing which number to assign.
> For oxygen applications use 1; For nitrogen or air applications use 2.

J = Material Thickness, (actual material thickness, range 0-0.999)

T = Focus Lens, (5.0 or 7.5)

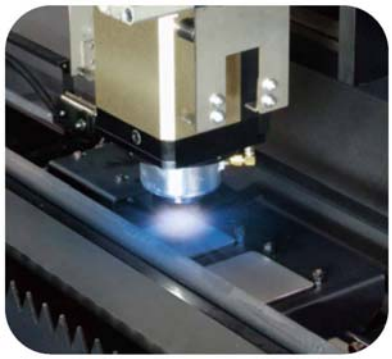
Z = Nozzle Orifice, (1.0, 1.2, 1.5, 2.0, 2.5, 3.0, 3.5, 3.0 mm)

W = Nozzle Type (0: Side Blow Normal, 1: Side Blow Double, 2: Slim Normal, 3: Slim Double)

U = Focus Setting (sets the lens position for cutting; material dependent, value listed in material charts)

Periodic G22 Functions

The following functions are performed automatically by the machine during a tool change or when required. They can also be controlled through the G22 command at anytime if needed. Manual control of these functions through the G22 command are used more for maintenance and troubleshooting.



G22B1: Blue Flame Calibration

This calibration is required anytime the focus lens is cleaned, replaced, or removed from the cutting head. Upon execution, the machine will open the Opt-i-Pod and perform several spark tests on the stainless steel plate located near the operator station. The machine will perform this calibration when needed, but manual execution can be used for troubleshooting cutting problems.

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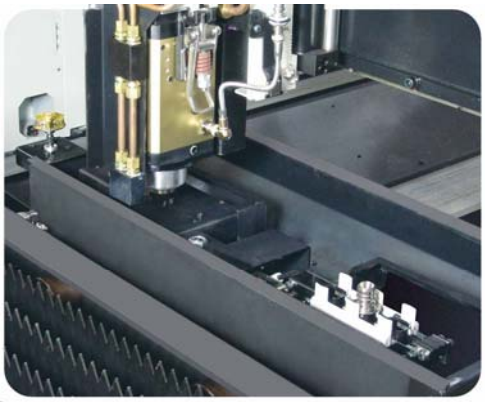
G22V1: Height Sensor Calibration



This calibration is performed automatically every time the machine changes nozzles. Upon execution, the cutting head enters the Opt-I-Pod and lowers the nozzle down until it touches the stainless steel plate located near the operation station. As the nozzle backs away from the stainless steel plate, several measurements are taken, completing the calibration. Manual execution of the command can be used anytime erratic height sensor performance is suspected.

G22C1: Nozzle Grinding

The nozzle grinder is located inside the Opt-i-Pod box found at the end of the table. The use of the grinder can be enabled/disabled through the *Intelligent Parameters* menu selection found near the bottom of the *Command* screen. With the function enabled, the machine will automatically clean the nozzle after it is picked up during a tool change, unless a *C0* argument is attached to the G22 line at the beginning of each program. Upon execution, the machine will briefly touch the top of the grinding stone followed by a circular movement through the rotating brush. The nozzle grinder can be used at anytime by executing the G22C1 command through an MDI statement, or by inserting the command at a desired location within a program.

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Process Monitoring

The STX-Mark III machine is equipped with process monitoring sensors to help improve efficiency and decrease part losses due to changes in the cutting process. These functions are implemented in the form of *Pierce Through Detection*, *Plasma Detection*, and *Burn Detection*. The benefits can be seen in thick mild steel, stainless steel, and aluminum applications. This section contains a description of each function as well as guidelines as to how and when to use them.

> **Note: To ensure the activation of any Process Monitoring functions, the option must be turned on in the Intelligent Parameter screen and all programs must contain a G22I (material type) command near the beginning of the program.**

Pierce Through Detection

Creating a pierce hole in good quality mild steel can take as much as 5 to 10 seconds. Factors such as plate temperature, material composition, rust, and scale can create even larger pierce time variations. In the past, to accommodate this large variance in pierce time, the machine had to be setup with the assumption that every pierce was going to take the maximum amount of time. This created situations where sometimes the pierce barely made it through the material, while other times it had 5 seconds to spare.

Properly adding the Pierce Through Detection codes to the piercing sub program will allow the machine to starting cutting the moment it detects the completion of the pierce. There are two G-codes associated with this function. The function is activated by a G124 code with a G125 code acting as a marker for the completion of the pierce. The G124 code is placed in the pierce sub program at a point just after the start of the pierce. This turns the pierce detection sensor on. The G125 code is placed in the pierce sub near the end of the program, located after the pierce dwell statement. Once the sensor detects the completion of the pierce, the program then jumps to the location of the G125 code, therefore bypassing the remaining pierce statements. Definitions of the G-codes are listed below. **Figure 14** shows sub programs with and without the pierce through detection codes.

> **G124P2, (P1: Standard Step Pierce, P2: Servo-Focus Pierce)**
> **G125, (Pierce Bypass Locator)**

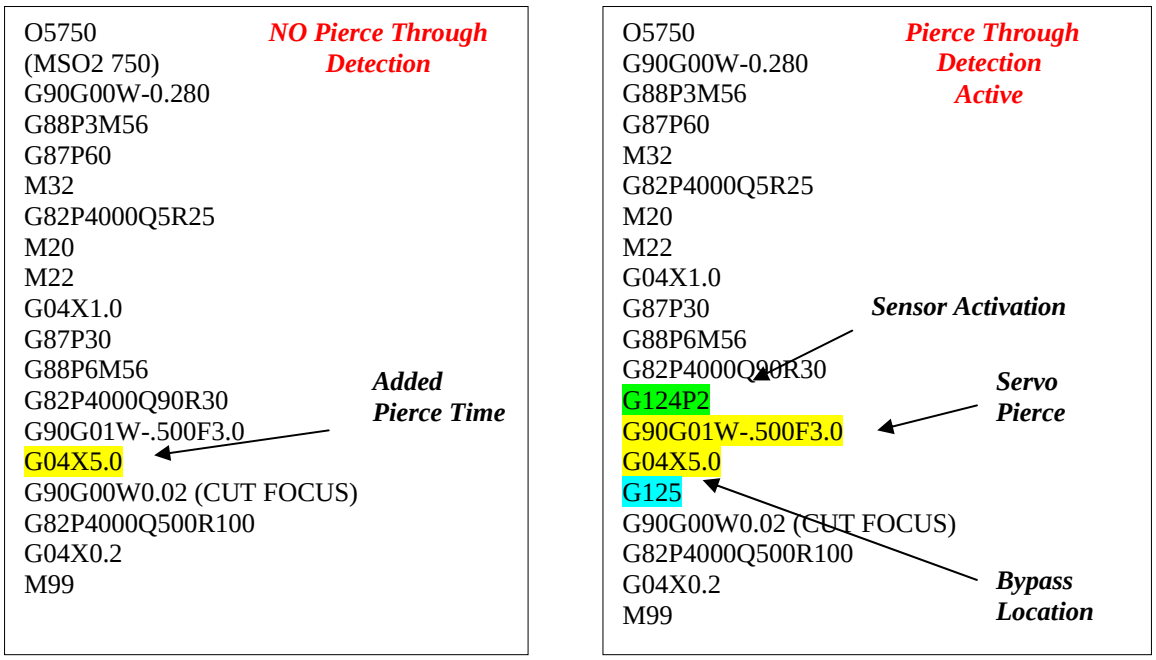

Figure 14 Pierce Through Detection Code Example

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Plasma Detection

Plasma Detection is used to prevent the loss of cut when processing primarily Stainless Steel and Aluminum over 4mm in thickness, but can be used for any nitrogen application within this thickness range. Plasma is the ball of blue light that can be seen near the surface of any material when nitrogen assist gas is used. The plasma ball absorbs some of the laser power which reduces the amount of power available to melt the material. Some plasma is normal, but as the cutting process becomes unstable the amount of plasma increases, eventually causing a loss of cut. Reducing the cutting feedrate will decrease the amount of plasma that is generated. The Plasma Detection sensor constantly monitors the amount of plasma generated by the cutting process. When the plasma level reaches a point where a loss of cut could occur, the machine quickly reduces the cutting feedrate preventing the cutting failure. Once the plasma level returns to normal, the machine increases the feedrate back to the original value. The cut quality seen in the sections where the plasma detection was active may not be dross free, but by preventing a loss of cut, scrapping the part can be avoided.

```
O8251
(SSN2 250)
(FAST)
(FEEDRATE 65)
G82P4000Q500R100F65.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135   <-- Plasma Detection On
M99
```

Figure 15 Plasma Detection Example

The activation of the Plasma Detection sensor is controlled through the G135 command. This command should be located near the beginning of the Fast, Medium, or Slow cutting condition sub program. The sensor is deactivated through the G136 command which should be placed in the Laser Off sub program. **Figures 15** and **16** show where to insert the Plasma Detection commands in the sub programs. **Note: Burn Detection and Plasma Detection are controlled by the same set of G-Codes.**

```
O9001
(OFF SUB)
M23
M09
M31
G91G00Z1.5
G90
G183
G136   <-- Plasma-Burn Detection Off
M99
```

Figure 16 Laser Off Sub Program

Burn Detection

Burn detection is used to prevent thermal burning when processing Mild Steel with oxygen over 4mm in thickness. Thermal burning occurs when the steel becomes over heated and the cutting process becomes unstable. The results can be a kerf width of 1/8-inch or wider or molten steel bubbling out on the top surface of the steel. Once this process starts, often the bad cutting continues throughout the remainder of the feature. In many cases, momentarily stopping the cutting process will cause the cut quality to return to normal. The Burn Detection sensor is constantly monitoring the cutting process for signs of thermal burning. If the start of thermal burning has been detected, the machine will either reduce the feedrate or completely stop the cutting process to correct the problem. Once the thermal burning has been corrected, the machine will continue cutting at the programmed feedrate. The Burn Detection will not completely eliminate the effects of the thermal burning, but it should stop the bad cutting quickly enough to allow the part to be removed from the sheet and saved.

```
O5501
(MSO2 500)
(FAST)
(FEEDRATE 48)
G82P4000Q500R100F48
G88P7M56
G87P10
G04X0.5
G135   <-- Burn Detection On
M99
```

Figure 17 Burn Detection Example

The activation of the Burn Detection sensor is controlled through the G135 command. This command should be located near the beginning of the Fast, Medium, or Slow cutting condition sub program. The sensor is deactivated through the G136 command which should be placed in the Laser Off sub program. **Figures 16** and **17** show where to insert the Burn Detection commands in the sub programs. **Note: Burn Detection and Plasma Detection are controlled by the same set of G-Codes.**

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Elliptical Positioning

Elliptical positioning is a function that allows the simultaneous movement of the X, Y, and Z axis during rapid position moves between features. Currently there are two ways to rapid travel between features. One approach is to leave the cutting head down in between features, which is a fast transition, but may increase the chances of a head crash during long movements. The second method is to perform a conventional Z lift which is safer, but adds extra processing time. The Elliptical movement combines the speed of a head down movement with the safety of a head lift. **Figure 18** illustrates the difference between a standard head lift and an Elliptical Position.

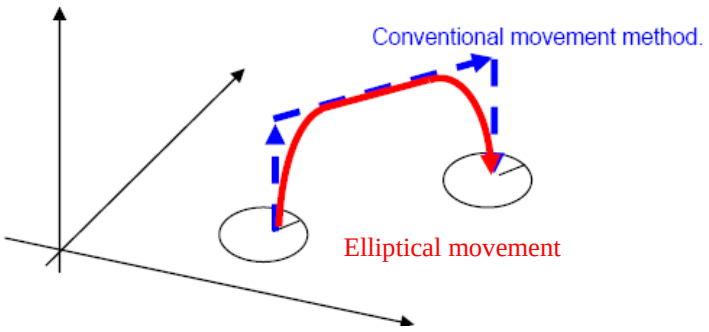

Figure 18 Elliptical Positioning Movement

Elliptical positioning movements are G-Code controlled. The G153 code is used to activate Elliptical Positioning. This code is modal which means it remains active until it is cancelled with a G150 code. The G153 code has a "Z" value attached, which is the amount of Z-axis lift applied to the movement. The values for the "Z" parameter are in either inches or metric depending on the machine mode of operation. The maximum value for "Z" cannot exceed the stroke of the Z-axis. These commands can either be placed in the laser off sub programs or inside the main CNC geometry program. Choosing which method to use to control the elliptical positioning will be dependent on the functionality of your programming software. See the examples below for sample elliptical positioning commands. **Note: The Mazak Smart System (Mazak CAD/CAM) inserts the elliptical commands inside the main CNC program.**

```
G153Z1.5      (1.5-inch Elliptical Lift)
G153Z50.0     (50mm Elliptical Lift)
G150          (Elliptical Positioning Cancel)
```

Programming Elliptical Movements (using laser off sub programs)

Controlling elliptical positioning through the laser off sub programs can be as simple as making a few code modifications to your existing sub programs. It is recommended that you have three different laser off sub programs depending on the type of hole to hole transition required. These programs should include the following laser off subs; A No-Lift sub, An Elliptical Lift sub, and A Traditional Lift sub. The CAD/CAM software should then choose the correct laser off sub program based on cutting sequence and slug obstructions. If your software does not have the ability to utilize multiple laser off sub programs, you may have to use the Elliptical Laser Off sub program for all features. **Figure 19** contains code examples for all three laser off sub programs.

```
O9002
(No Lift)
M23
M09
G87P10
G183
G136
G150
M99
```

```
O9001
(Elliptical Lift)
M23
M09
G87P35
G153Z1.5
G90
G183
G136
M99
```

```
O9003
(Traditional Lift)
M23
M09
M31
G91G00Z1.5
G90
G183
G136
M99
```

Figure 19 Laser Off Sub Program Examples

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Programming Elliptical Movements (through CAD/CAM)

Some CAD/CAM packages are capable of controlling the elliptical movements by directly inserting the elliptical G-codes within the main CNC geometry file. This is the most efficient method since the software will use the head down approach for short transitions and use the safer elliptical lift for longer movements. The main program will then contain numerous G153 and G150 commands throughout the program depending on the type of lift required for the next rapid travel movement. With this style of programming, there is only a need for one Laser Off Sub program. Since the decision whether or not to lift is controlled in the main program, the Laser Off program does not need to contain any elliptical commands. **Figure 20** contains a main CNC program with the elliptical commands and the corresponding Laser Off sub program.

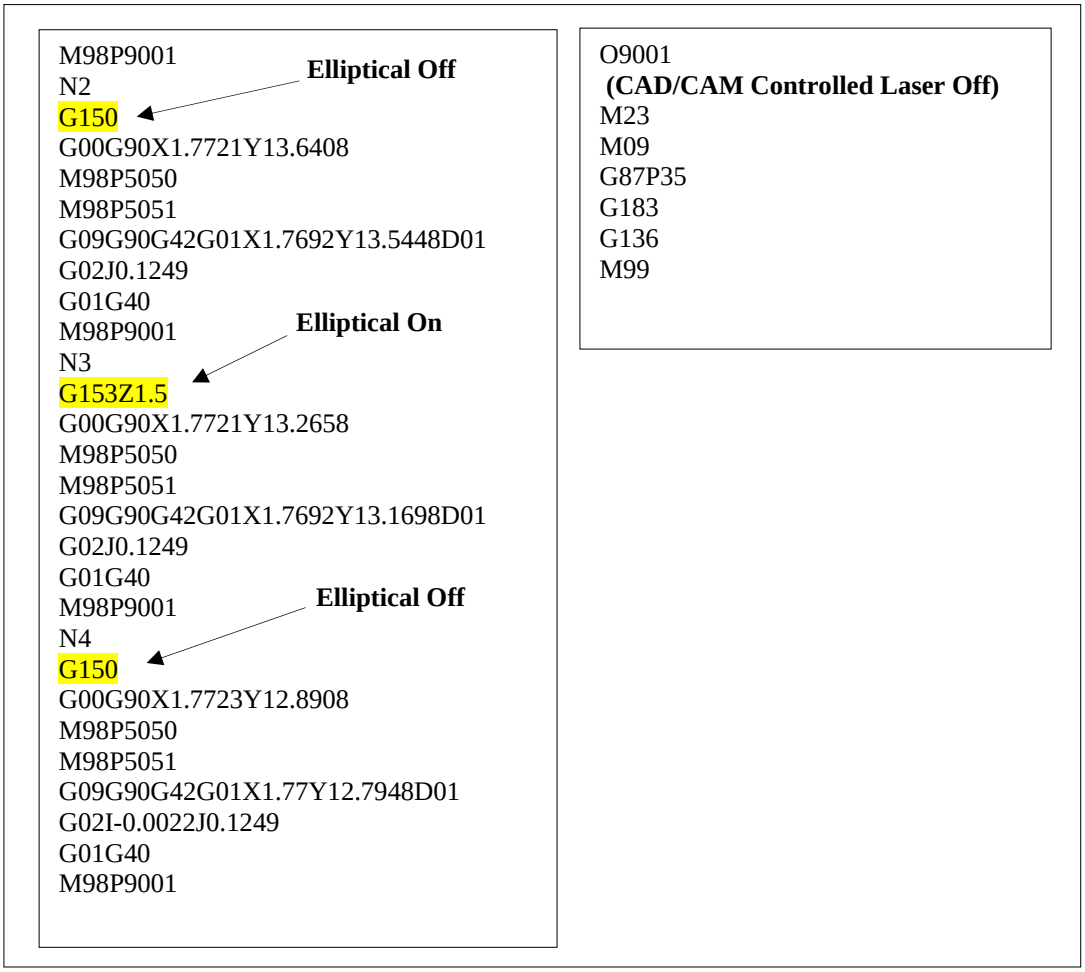

Figure 20 Elliptical Control Through CAD/CAM

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Assist Gas Consumption

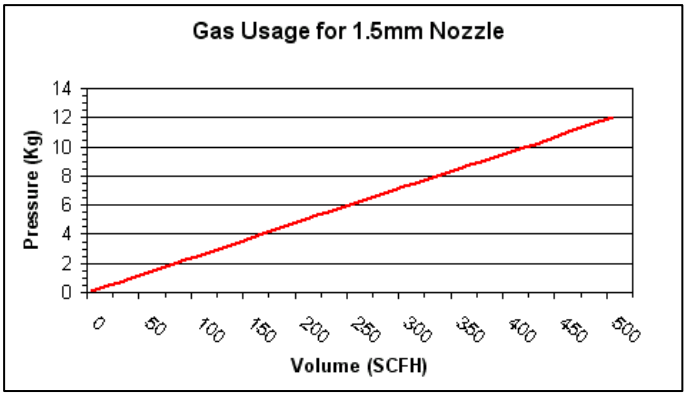
The amount of assist gas used while operating the machine can have a significant impact on the overall costs involved with processing the parts. There are a number of factors that contribute to the assist gas usage. Some of the factors cannot be controlled, such as nozzle design and gas temperature, but there are several other items, which can be controlled by the laser operator. These include; nozzle diameter, assist gas pressure, assist gas type, and nozzle to material gap. This section contains gas usage graphs for various nozzle diameters. Use the information from the cut tables combined with the information in these charts to determine the gas consumption for any application.

The assist gas type means choosing between processing the part with oxygen or nitrogen. Even though the bulk price of oxygen and nitrogen can be very similar, using nitrogen could require as much as 10-times the amount of gas, or more. Oxygen pressures are typically relatively low (0.5-5.0kg/cm^3) compared to nitrogen, which usually is in the 6-15kg/cm^3 range. The oxygen process in most cases, involves using a smaller diameter nozzle orifice. This smaller orifice combined with the lower pressure contributes to the large difference gas usage. Some considerations, which determine assist gas type, are feedrate, weld-ability, and paint-ability.

The most significant factor contributing to gas usage is nozzle diameter. Take the following example:

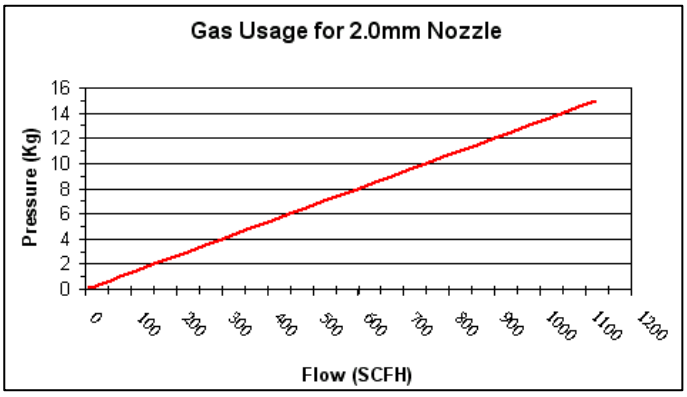
- 12kg through a 1.5mm nozzle yields approximately *500* Standard Cubic Feet per Hour (SCFH)
- 12kg through a 2.0mm nozzle yields approximately *900* SCFH

Even though the nozzle is only 25% larger the gas usage increased by 80%. In fact, the gas pressure for the 2mm nozzle *(in the previous example)* would need to drop to 7kg in order to decrease the volume to the 500 SCFH produced by the 1.5mm nozzle. This decrease in gas pressure most likely would not produce a good cut with the 2.0mm nozzle. Keep in mind that the best nozzle for a given application may not be the one, which yields the lowest gas usage. In many case, the larger nozzle diameters produce a more consistent cut in high-pressure applications. The nozzle diameters listed in the cut tables were chosen because they were found to produce the most stable cut.



The final factor contributing to gas consumption is the nozzle to material gap. The typical gap values range from 0.5mm to 1.5mm. Having the nozzle closer to the material increases the amount of backpressure on the gas exiting the nozzle. This has the effect of decreasing the gas consumption. The values in the following charts assume no backpressure; therefore actual consumption values will be slightly lower. These values can be used as a worst-case scenario.

Useful conversions: 1 kg/cm^3 = 14.5 psi
SCFM = SCFH ÷ 60



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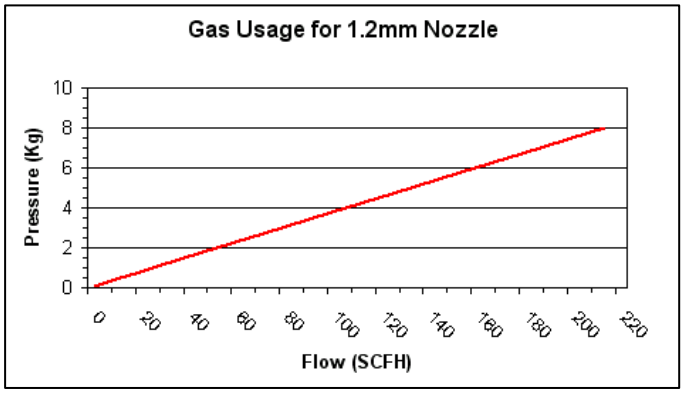
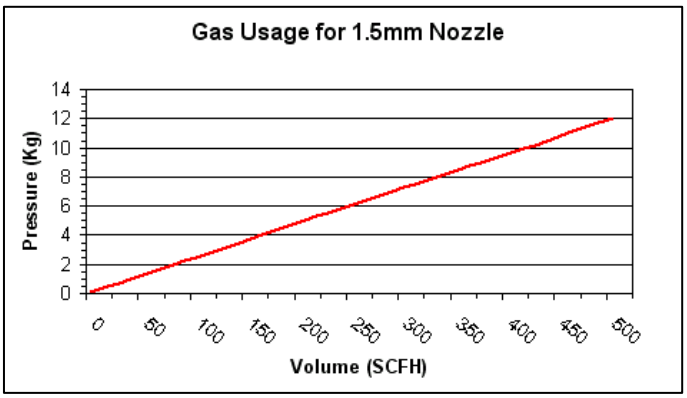
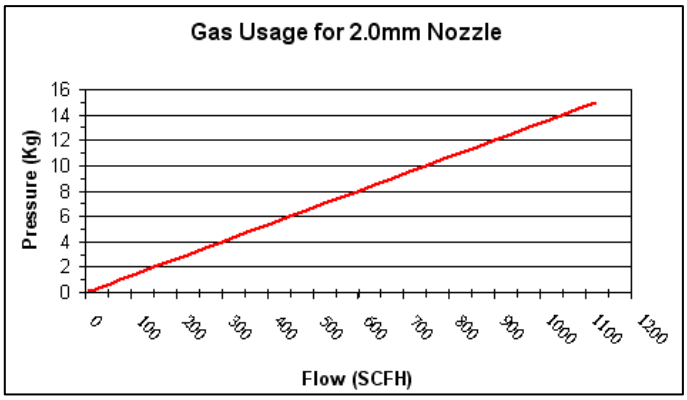
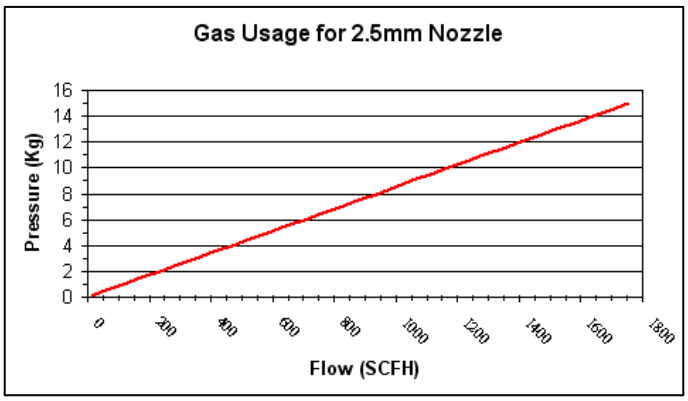
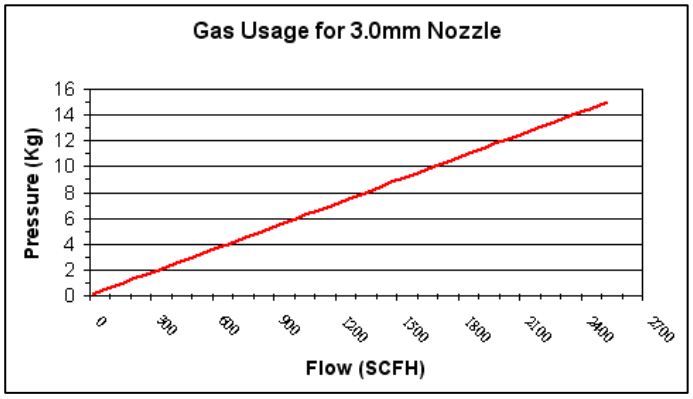
Gas Consumption Charts











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Sub Program Numbering

The cutting conditions for each material type and thickness have separate sub programs, which are stored in the NC control. The name of each sub program must be in the form of a 4-digit number. The names can be any number ranging from 0001 to 9999. Since the program number on its own does not specify which set of cut conditions reside within it, finding some naming convention related to material type and thickness makes sense. The cutting charts provided in this manual contain suggested program numbers, which match the data loaded into the machine upon installation. The following information explains how to relate the 4-digit number to the material type and thickness. **Figure 21** illustrates several sub program number examples.

The first number in the program name refers to the material type and assist gas used. The numbers can range for 5 to 9.

8 = Stainless Steel with Nitrogen
7 = Aluminum with Nitrogen
6 = Mild Steel with Nitrogen
5 = Mild Steel with Oxygen

8142: (Stainless Steel, 0.135” with N2, Medium cut)

7183: (Aluminum, 0.180” with N2, Slow cut)

6120: (Mild Steel, 0.120” with N2, Pierce only)

5061: (Mild Steel 0.060” with O2, Fast cut)

Figure 21 ***Sub program number examples***

The second 2 digits represent the material thickness in inches.
In most cases the value is rounded up to the next highest number.
(Example: 0.075” would be 08; 0.120” would be 12)

The last digit represents whether the cut is a Pierce, Fast, Medium, or Slow cut.

0 = Pierce only
1 = Fast cut
2 = Medium cut
3 = Slow cut
4 = *User defined special geometry cut*
5 = *User defined*
6 = Acceleration condition for leadin
7 = *User defined*
8 = *User defined*
9 = Alternate pierce

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G04 This code produces a pause in the machine operation for a specified amount time. All currently active G and M codes remain active during the pause. This code is used mainly for piercing dwells, power stabilization, and corner cooling. *Ex: G04X0.5 (produces a 0.5 second dwell)*

G09 This non-modal code is used to avoid unwanted rounding of sharp corners. This code is only active for the line on which it appears. Rounding can occur on thin material when the processing speeds are high. *G09 is preferred over the similar G61 code.*

G22 This non-modal code is used to control the automated setup features of the machine. Please refer to page 13 for a detailed description of this code.

G61 This modal code is used to avoid unwanted rounding of sharp corners. Rounding can occur on thin material when the processing speeds are high. Inserting this code at the beginning of a main program can fix the rounding, but it will cause a slight hesitation at every intersection. This may increase processing times. A better solution is to have the CAM software automatically insert a G09 on any intersection where a sharp corner is needed. *G61 is canceled by a G64 code.*

G64 This code cancels the modal G61 code.

G82 This modal code controls the commanded power of the laser. There are 4 parameters (P, Q, R, & F) associated with the G82 code. **P** sets the commanded power; **Q** sets the commanded frequency; **R** sets the commanded duty cycle; and F sets the commanded cutting feedrate. This command is used for setting piercing as well as cutting conditions. *Ex: G82P1300Q500R95F150 (sets condition of 1300W, 500Hz, 95% duty, and 150 ipm)*

G87 This modal code sets the nozzle height in reference to the material surface. There is one parameter (P) associated with the G87 code. The **P** value is the amount of height adjustment from a standard 1mm (0.040") gap. No decimal point is used in the P value. *Ex: G87P10 = 2.0mm gap, G87P0 = 1.0mm gap, G87P5 = 1.5mm gap.*

G88 This modal code controls the cutting assist gas pressure. There is one parameter (P) associated with the G88 code. The **P** value is the amount of commanded gas pressure in KG. There is an assumed decimal in the P value, therefore a P10 equals 1.0KG. With the standard machine configuration, programmable gas values can not exceed 6.0 kg. *Ex: G88P60*

Note: *Machines equipped with the programmable high assist gas option can command pressures over 6.0KG by combining the M54 code with the G88 command. Ex: G88P120M54 = 12.0 KG*
These machines will not have a manual "T" handle adjustment knob.

G90 This modal code set how coordinates are reference on the machine. With G90 active, all cutting and non-cutting movements are referenced from one zero point.

G91 This modal code set how coordinates are reference on the machine. With G91 active, all cutting and non-cutting movements are referenced incrementally from the current machine location.

G124 This modal code activates the Pierce Through Process Monitoring Function. There is one parameter (P) associated with the G124 code. The **P** value specifies which type of pierce is being used. *Ex: G124P1 = Step Pierce, G124P2 = Servo Pierce.*

G125 This code cancels the G124 Pierce Through Detection code.

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G135 This modal code activated both the Plasma Detection and Burn Detection functions. The G135 code is inserted in the Fast, Medium, and Slow cut conditions sub programs. These functions are application dependent. Please refer to the Process Monitoring section of this manual for more information.

G136 This code cancels the G135 Plasma/Burn Detection code.

G150 This code cancels the G153 Elliptical Positioning code.

G153 This code activates the elliptical Positioning function of the machine. This code converts the Z axis head lifts between features into a smooth arc motion. There is one parameter (Z) associated with the G153 code. The **Z** value specifies the maximum height the nozzle will retract during an Elliptical Lift. See the Elliptical Positioning section for more details. *Ex: G153Z1.5 = 1.5 inch maximum nozzle retraction.*

G181 This modal code controls the *Real Time Power Ramping* function of the machine. The G181 command changes the laser duty cycle in accordance with the speed of the nozzle at acceleration and deceleration velocity. The duty is changed according to the ratio of command speed and actual speed. This function is used to prevent sharp corners form over heating. There is one parameter (R) associated with the G181 code. The **R** value specifies the minimum duty cycle that will be applied to the material when the process feedrate drops to 0 inches per minute.

G183 This code cancels the G181 Real Time Power Ramping code.

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M20 This machine code opens the shutter. The laser shutter needs to be open to allow the beam to travel to the cutting table.

M21 This machine code closes the shutter.

M22 This machine code turns *on* the laser discharge. This code is makes the values set in the *G82* statement active.

M23 This machine code turns *off* the laser discharge.

M31 This machine code disables the height sensor.

M32 This machine code enables the height sensor. Upon executing the M32 code, the cutting head with move down to a nozzle height set by the G87 code.

M54 This machine code starts high-pressure assist gas flowing through the nozzle from the 3rd assist gas port. The amount of pressure is set by a manual "T" handle valve located beneath the operator station.

Note: *Machines equipped with the programmable high assist gas option can command pressures over 6.0KG by combining the M54 code with the G88 command. Ex: G88P120M54 = 12.0 KG*
These machines will not have a manual "T" handle adjustment knob.

M56 This machine code starts oxygen flowing through the nozzle. The amount of pressure is set by the G88 code. *Ex: G88P10**M56*** (turns on 1.0kg of oxygen) ** Pressure limited to 5-6 kg.

M57 This machine code starts shop air flowing through the nozzle. The amount of pressure is set by the G88 code. *Ex: G88P10**M56*** (turns on 1.0kg of shop air) ** Pressure limited to 2-3 kg.

M58 This machine code starts nitrogen flowing through the nozzle. The amount of pressure is set by the G88 code. *Ex: G88P10**M56*** (turns on 1.0kg of nitrogen) ** Pressure limited to 5-6 kg.

M60 This Machine code starts the flow of high pressure air from the Side Blow air blast nozzle. A G04 dwell statement is normally used to control the length of time that the air pressure is active.

M61 This Machine code cancels the M60 Side Blow air blast command.

M65 This Machine code cancels the M66 Side Blow anti-spatter spray command

M66 This Machine code starts the flow of anti-spatter oil from the Side Blow mist nozzle. A G04 dwell statement is normally used to control the length of time that the mist is active.

M99 This machine code signifies the end of a sub program.

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Material Cut Table

Mild Steel *(Oxygen)*

Material Type: *CRS/HR-A36*
Thickness Range: *0.036” to 0.750”*
Assist Gas: *Oxygen*
Focus Lens: *7.5 Inch*
Data Set: *FMS Setup*

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0.036" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.036 U-0.040

Servo Pierce	Step			
5040	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5041	5042	5043	101
Feed (ipm)	250-280	110	40	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1500	800	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	15	15	15	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5040 (MS040 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5041 (MS040 FAST)
G82P1500Q500R100F250.0
G88P15M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.048" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.048 U-0.040

Servo Pierce	Step			
5050	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5051	5052	5053	101
Feed (ipm)	230-275	110	40	75
Focus (inch)	-0.04	-0.04	-0.04	-0.040
Power (w)	1500	800	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	20	20	20	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5050 (MS050 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5051 (MS050 FAST)
G82P1500Q500R100F230.0
G88P20M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.060" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.060 U-0.040

Servo Pierce	Step			
5060	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5061	5062	5063	101
Feed (ipm)	220-250	100	40	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1500	800	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	30	30	20	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5060 (MS060 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5061 (MS060 FAST)
G82P1500Q500R100F220.0
G88P30M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.080" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.080 U-0.040

Servo Pierce	Step			
5080	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5081	5082	5083	101
Feed (ipm)	170-195	90	35	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	800	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	35	35	20	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5080 (MS080 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5081 (MS080 FAST)
G82P1000Q500R100F170.0
G88P35M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.090" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.090 U-0.040

Servo Pierce	Step			
5090	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5091	5092	5093	101
Feed (ipm)	150-175	80	30	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	800	1500	500
Frequency (Hz)	500	500	100	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	35	35	20	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5090 (MS090 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5091 (MS090 FAST)
G82P1000Q500R100F150.0
G88P35M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.105" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.105 U-0.040

Servo Pierce	Step			
5100	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5101	5102	5103	101
Feed (ipm)	130-170	70	30	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	800	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	40	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	40	40	20	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5100 (MS105 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5101 (MS105 FAST)
G82P1000Q500R100F130.0
G88P40M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.120" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.120 U-0.040

Servo Pierce	Step			
5120	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5121	5122	5123	101
Feed (ipm)	135-165	65	35	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	2500	1000	1500	500
Frequency (Hz)	500	500	150	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5120 (MS120 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5121 (MS120 FAST)
G82P2500Q500R100F135.0
G88P4M56
G87P5
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.135" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.135 U0.00

Servo Pierce	Step			
5140	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5141	5142	5143	101
Feed (ipm)	125-160	60	30	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	3300	1000	1500	500
Frequency (Hz)	500	500	150	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	35	(off)	(off)
Dwell (sec)	0.3	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5140 (MS140 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5141 (MS140 FAST)
G82P3300Q500R100F125.0
G88P4M56
G87P5
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner Radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.160" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.160 U0.00

Servo Pierce	Step			
5160	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	15			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	7			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5161	5162	5163	101
Feed (ipm)	115-150	90	30	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	3800	1000	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	10	10	10
Nozzle Gap (G87P)	5	0	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5160 (MS160 PIERCE)
G90G00W-0.100
G88P7M56
G87P20
M32
G82P2000Q15R20
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O5161 (MS160 FAST)
G82P3800Q500R100F115.0
G88P4M56
G87P5
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner Radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.180" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.180 U0.00

Servo Pierce	Step			
5180	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	15			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	7			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5181	5182	5183	101
Feed (ipm)	110-145	60	25	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1000	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5180 (MS180 PIERCE)
G90G00W-0.100
G88P7M56
G87P20
M32
G82P2000Q15R20
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O5181 (MS180 FAST)
G82P4000Q500R100F110.0
G88P4M56
G87P5
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner Radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.250" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1 J0.250 U0.00

Servo Pierce	Step			
5250	1	2	3	4
Focus (inch)	-0.160			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	15			
Duty Cycle (%)	30			
Gas Type	M56			
Gas Pressure (G88P)	6			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5251	5252	5253	101
Feed (ipm)	95-115	50	20	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1200	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	10	10	10	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5250 (MS250 PIERCE)
G90G00W-0.160
G88P6M56
G87P30
M32
G82P2500Q15R30
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O5251 (MS250 FAST)
G82P4000Q500R100F95.0
G88P4M56
G87P10
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner Radius: 0.025 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.320" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I1 J0.320 U-0.020

Servo Pierce	Step			
5320	1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	-0.020
Feedrate (inch)	-	26	-	-
Power (W)	2500	2500	2500	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	15	22	22	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.3	(0.1)	2.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5321	5322	5323	101
Feed (ipm)	58-68	30	12	75
Focus (inch)	-0.020	-0.020	-0.020	-0.020
Power (w)	1800	1150	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	5	6	8	10
Nozzle Gap (G87P)	10	10	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5320 (MS320 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P2500Q10R15
M20
M22
G04X0.3
G87P20
G88P4M56
G82P2500Q100R22
G90G01W-.160F26.0
G124P2
G04X2.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5321 (MS320 FAST)
G82P1800Q500R100F58
G88P05M56
G87P10
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.3 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.3 seconds
Corner Radius: 0.035 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.380" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I1 J0.380 U-0.020

Servo Pierce 5380	Step 1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	-0.020
Feedrate (inch)	-	15	-	-
Power (W)	2500	2500	2500	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	15	22	22	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.5	(0.2)	3.0	0.2

Cut	*Fast* 5381	*Medium* 5382	*Slow* 5383	*Etch* 101
Feed (ipm)	50-57	35	8	75
Focus (inch)	-0.020	-0.020	-0.020	-0.020
Power (w)	2500	1500	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	6	6	8	10
Nozzle Gap (G87P)	10	10	10	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5380 (MS380 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P2500Q10R15
M20
M22
G04X0.5
G87P20
G88P4M56
G82P2500Q100R22
G90G01W-.160F15.0
G124P2
G04X3.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5381 (MS380 FAST)
G82P2500Q500R100F50.0
G88P5M56
G87P10
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.3 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.3 seconds
Corner Radius: 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.500" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I1 J0.500 U0.020

Servo Pierce	Step			
5500	1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	0.020
Feedrate (inch)	-	8	-	-
Power (W)	3000	3000	3000	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	20	34	34	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.8	(0.3)	5.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5501	5502	5503	101
Feed (ipm)	40-46	33	8	75
Focus (inch)	0.020	0.020	0.020	0.020
Power (w)	2500	2000	2500	500
Frequency (Hz)	500	500	30	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	6	7	8	10
Nozzle Gap (G87P)	20	20	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5500 (MS500 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P3000Q10R20
M20
M22
G04X0.8
G87P20
G88P4M56
G124P2
G82P3000Q100R34
G90G01W-.160F8.0
G04X5.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5501 (MS500 FAST)
G82P2500Q500R100F40
G88P6M56
G87P20
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : 0.5 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.5 seconds
Corner Radius: 0.050 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required

Comments: Holes 5/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.630" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I1 J0.630 U0.040

Servo Pierce	Step			
5630	1	2	3	4
Focus (inch)	-0.120	-0.200	-0.200	0.040
Feedrate (inch)	-	4	-	-
Power (W)	3000	3000	3000	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	20	36	36	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	5	5	5
Nozzle Gap (G87P)	60	20	20	20
Dwell (sec)	1.0	(1.2)	5.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5631	5632	5633	101
Feed (ipm)	32-36	26	6	75
Focus (inch)	0.040	0.040	0.040	0.040
Power (w)	3400	2500	3000	500
Frequency (Hz)	500	500	20	125
Duty Cycle (%)	100	100	35	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	5	5	10
Nozzle Gap (G87P)	20	20	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	5636
Feed (ipm)	5
Focus (inch)	0.040
Power (w)	4000
Frequency (Hz)	30
Duty Cycle (%)	50
Gas Type	M56
Gas Pressure (G88P)	6
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O5630 (MS630 PIERCE)
G90G00W-0.120
G88P4M56
G87P60
M32
G82P3000Q10R20
M20
M22
G04X1.0
G87P20
G88P5M56
G124P2
G82P3000Q100R36
G90G01W-.200F4.0
G04X5.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5631 (MS630 FAST)
G88P4M56
G87P20
G82P3400Q500R100F32
M22
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.300 inch or greater
Dwell at end of Lead-in : 0.7 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.7 seconds
Corner Radius: 0.065 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required

Comments: Holes 3/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.750" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I1 J0.750 U0.040

Servo Pierce	Step			
5750	1	2	3	4
Focus (inch)	-0.120	-0.200	-0.200	0.040
Feedrate (inch)	-	4	-	-
Power (W)	3300	3500	3500	3500
Frequency (Hz)	12	80	80	30
Duty Cycle (%)	20	33	33	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	60	20	20	20
Dwell (sec)	1.0	(1.2)	8.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5751	5752	5753	101
Feed (ipm)	28-32	22	5	75
Focus (inch)	0.040	0.040	0.040	0.040
Power (w)	4000	2500	3000	500
Frequency (Hz)	500	500	20	125
Duty Cycle (%)	100	100	35	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	5	5	10
Nozzle Gap (G87P)	20	20	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	5756
Feed (ipm)	5
Focus (inch)	0.040
Power (w)	4000
Frequency (Hz)	30
Duty Cycle (%)	50
Gas Type	M56
Gas Pressure (G88P)	6
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O5750 (MS750 PIERCE)
G90G00W-0.120
G88P4M56
G87P60
M32
G82P3300Q12R20
M20
M22
G04X1.0
G87P20
G88P4M56
G124P2
G82P3500Q80R33
G90G01W-.20F4.0
G04X8.0
G125
M23
G90G00W[#994/25.4]
G82P3500Q30R30
M22
G04X0.2
M99
```

```
O5751 (MS750 FAST)
G88P4M56
G87P20
G82P4000Q500R100F28.0
M22
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.300 inch or greater
Dwell at end of Lead-in : 1.0 second
Exact Stops : Not Needed
Corner cooling dwell : 1.0 second
Corner Radius: 0.075 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required

Comments: Holes 1.0" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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Material Cut Table

Mild Steel *(Nitrogen)*

Material Type: *CRS*
Thickness Range: *0.036” to 0.250”*
Assist Gas: *Nitrogen*
Focus Lens: *7.5 Inch*
Data Set: *FMS Setup*

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0.036" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.036 U-0.040

Servo Pierce	Step			
6040	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6041	6042	6043	103
Feed (ipm)	325-380	200	100	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	75	75	75	10
Nozzle Gap (G87P)	-3	0	0	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O6040 (MS060 PIERCE)
G90G00W-0.04
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99

O6041 (MS060 FAST)
G82P4000Q500R100F325.0
G88P70M54 (7.5KG)
G87P-3
G181R25
G04X0.1
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.048" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.048 U-0.040

Servo Pierce	Step			
6050	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6051	6052	6053	103
Feed (ipm)	285-360	180	90	75
Focus (inch)	-0.04	-0.04	-0.04	-0.040
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	0	0	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O6050 (MS060 PIERCE)
G90G00W-0.04
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99

O6051 (MS060 FAST)
G82P4000Q500R100F285.
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.1
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.060" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.060 U-0.040

Servo Pierce	Step			
6060	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6061	6062	6063	103
Feed (ipm)	250-290	160	80	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	0	0	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6060 (MS060 PIERCE)
G90G0W-0.060
G88P10M58
G87P10
G82P1500Q20R20
M32
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O6061 (MS060 FAST)
G82P4000Q1000R100F250.
G88P110M54 (11.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.080" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.080 U-0.040

Servo Pierce	Step			
6080	1	2	3	4
Focus (inch)	-0.075			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6081	6082	6083	103
Feed (ipm)	215-240	150	70	75
Focus (inch)	-0.075	-0.075	-0.075	-0.075
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6080 (MS080 PIERCE)
G90G00W-0.075
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6081 (MS080 FAST)
G82P4000Q500R100F215.
G88P100M54 (10.0KG)
G87P-3
G181R35
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.090" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.090 U-0.075

Servo Pierce	Step			
6090	1	2	3	4
Focus (inch)	-0.075			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6091	6092	6093	103
Feed (ipm)	190-235	140	60	75
Focus (inch)	-0.075	-0.075	-0.075	-0.075
Power (w)	4000	2500	1500	500
Frequency (Hz)	500	500	100	125
Duty Cycle (%)	100	100	30	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	20	10
Nozzle Gap (G87P)	-3	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6090 (MS090 PIERCE)
G90G00W-0.075
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6091 (MS090 FAST)
G82P4000Q500R100F190.
G88P100M54 (10.0KG)
G87P-3
G181R35
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.105" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.105 U-0.075

Servo Pierce	Step			
6100	1	2	3	4
Focus (inch)	-0.075			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6101	6102	6103	103
Feed (ipm)	165-195	100	45	75
Focus (inch)	-0.075	-0.075	-0.075	-0.075
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-4	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6100 (MS105 PIERCE)
G90G00W-0.075
G88P10M58
G87P10
G82P1500Q20R30
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6101 (MS105 FAST)
G82P4000Q500R100F165.
G88P100M54 (10.0KG)
G87P-3
G181R35
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.120" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.120 U-0.100

Servo Pierce	Step			
6120	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6121	6122	6123	103
Feed (ipm)	150-180	90	40	75
Focus (inch)	-0.100	-0.100	0.100	-0.100
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-4	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6120 (MS120 PIERCE)
G90G00W-0.100
G88P10M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6121 (MS120 FAST)
G82P4000Q500R100F150.
G88P100M54 (10.0KG)
G87P-3
G181R35
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.135" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.135 U-0.110

Servo Pierce	Step			
6140	1	2	3	4
Focus (inch)	-0.110			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	30			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6141	6142	6143	103
Feed (ipm)	130-160	75	35	75
Focus (inch)	-0.110	-0.100	-0.100	0.000
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	0	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6140 (MS140 PIERCE)
G90G00W-0.110
G88P10M58
G87P20
G82P2500Q30R30
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6141 (MS140 FAST)
G82P4000Q500R100F130.0
G88P100M54 (10.0KG)
G87P0
G181R35
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.160" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.160 U-0.125

Servo Pierce	Step			
6160	1	2	3	4
Focus (inch)	-0.200			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	5			
Duty Cycle (%)	55			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6161	6162	6163	103
Feed (ipm)	100-115	65	55	75
Focus (inch)	-0.125	-0.125	-0.126	-0.125
Power (w)	4000	2500	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
	6166
Feed (ipm)	15
Focus (inch)	-0.125
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6160 (MS160 PIERCE)
G90G00W-.200
G88P8M58
G87P30
M32
G82P4000Q5R55
M20
M22
G04X0.3
G135
G90G00W[#994/25.4]
M99
```

```
O6161 (MS160 FAST)
G82P4000Q500R100F100.0
G88P100M54 (10.0KG)
G87P-3
G181R35
G04X0.3
G135
M99
```

```
O6166 (MS160 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.180" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.180 U-0.140

Servo Pierce	Step			
6180	1	2	3	4
Focus (inch)	-0.250			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	30			
Duty Cycle (%)	25			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6181	6182	6183	103
Feed (ipm)	72-85	55	55	75
Focus (inch)	-0.140	-0.140	-0.140	-0.140
Power (w)	4000	3700	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	6186
Feed (ipm)	15
Focus (inch)	-0.140
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6180 (MS180 PIERCE)
G90G00W-.250
G88P8M58
G87P30
G82P4000Q30R25
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6181 (MS180 FAST)
G82P4000Q500R100F72.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O6186 (MS180 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use Not Neededr
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.250" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.250 U-0.325

Servo Pierce	Step			
6250	1	2	3	4
Focus (inch)	-0.325			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	5			
Duty Cycle (%)	55			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.4			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6251	6252	6253	103
Feed (ipm)	48-55	40	40	75
Focus (inch)	-0.235	-0.235	-0.235	0.000
Power (w)	4000	3700	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	120	120	120	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	6256
Feed (ipm)	10
Focus (inch)	-0.235
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6250 (MS250 PIERCE)
G90G00W-.325
G88P8M58
G87P30
M32
G82P4000Q5R55
M20
M22
G04X0.4
G135
G90G00W[#994/25.4]
M99
```

```
O6251 (MS250 FAST)
G82P4000Q500R100F48.0
G88P120M54 (12KG)
G87P-3
G04X0.8
G135
M99
```

```
O6256 (MS250 LEADIN)
G82P4000Q500R100F10.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Material Cut Table

Stainless Steel *(Nitrogen)*

Material Type: *304*
Thickness Range: *0.036” to 0.500”*
Assist Gas: *Nitrogen*
Focus Lens: *7.5 Inch*
Data Set: *FMS Setup*

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0.036" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.036 U-0.060

Servo Pierce	Step			
8040	1	2	3	4
Focus (inch)	-0.060			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8041	8042	8043	103
Feed (ipm)	310-365	160	85	75
Focus (inch)	-0.060	-0.060	-0.060	-0.060
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	0	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8040 (SS040 PIERCE)
G90G00W-0.060
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8041 (SS040 FAST)
G82P4000Q500R100F310.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.048" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I2 J0.048 U-0.070

Servo Pierce	Step			
8050	1	2	3	4
Focus (inch)	-0.070			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8051	8052	8053	103
Feed (ipm)	270-325	150	75	75
Focus (inch)	-0.070	-0.070	-0.070	-0.070
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8050 (SS050 PIERCE)
G90G00W-0.070
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8051 (SS050 FAST)
G82P4000Q500R100F270.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.060" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.060 U-0.070

Servo Pierce	Step			
8060	1	2	3	4
Focus (inch)	-0.070			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8061	8062	8063	103
Feed (ipm)	235-270	140	65	75
Focus (inch)	-0.070	-0.070	-0.070	-0.070
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	70	70	70	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8060 (SS060 PIERCE)
G90G00W-0.070
G88P10M58
G87P10
G82P1500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8061 (SS060 FAST)
G82P4000Q500R100F235.0
G88P70M54 (7.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.080" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.080 U-0.090

Servo Pierce	Step			
8080	1	2	3	4
Focus (inch)	-0.090			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8081	8082	8083	103
Feed (ipm)	210-250	130	60	75
Focus (inch)	-0.090	-0.090	-0.090	-0.090
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	70	70	70	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O8080 (SS080 PIERCE)
G90G00W-0.090
G88P10M58
G87P10
G82P2500Q20R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99

O8081 (SS080 FAST)
G82P4000Q500R100F210.0
G88P70M54 (7.0KG)
G87P-3
G181R25
G04X0.2
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.090" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.090 U-0.100

Servo Pierce	Step			
8090	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8091	8092	8093	103
Feed (ipm)	190-220	115	55	75
Focus (inch)	-0.100	-0.100	-0.100	-0.100
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O8090 (SS090 PIERCE)
G90G00W-0.100
G88P10M58
G87P10
G82P2500Q20R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99

O8091 (SS090 FAST)
G82P4000Q500R100F190.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.2
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.105" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.105 U-0.110

Servo Pierce	Step			
8100	1	2	3	4
Focus (inch)	-0.110			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8101	8102	8103	103
Feed (ipm)	170-190	100	50	75
Focus (inch)	-0.110	-0.110	-0.110	-0.110
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8100 (SS105 PIERCE)
G90G00W-0.110
G88P10M58
G87P10
G82P2500Q20R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O8101 (SS105 FAST)
G82P4000Q500R100F170.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.120" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.120 U-0.110

Servo Pierce	Step			
8120	1	2	3	4
Focus (inch)	-0.110			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8121	8122	8123	103
Feed (ipm)	150-170	90	45	75
Focus (inch)	-0.110	-0.110	-0.110	-0.110
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O8120 (SS120 PIERCE)
G90G00W-0.110
G88P10M58
G87P20
G82P2500Q20R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99

O8121 (SS120 FAST)
G82P4000Q500R100F150.0
G88P90M54 (9.0KG)
G87P-3
G181R35
G04X0.2
M99

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.135" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.135 U-0.150

Servo Pierce	Step			
8140	1	2	3	4
Focus (inch)	-0.150			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8141	8142	8143	103
Feed (ipm)	135-160	70	45	75
Focus (inch)	-0.150	-0.150	-0.150	-0.150
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8140 (SS140 PIERCE)
G90G00W-0.150
G88P10M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O8141 (SS140 FAST)
G82P4000Q500R100F135.0
G88P100M54 (10.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.160" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.160 U-0.165

Servo Pierce	Step			
8160	1	2	3	4
Focus (inch)	-0.165			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8161	8162	8163	103
Feed (ipm)	110-130	55	35	75
Focus (inch)	-0.165	-0.165	-0.165	-0.125
Power (w)	4000	2500	2800	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	130	130	130	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8166
Feed (ipm)	30
Focus (inch)	-0.165
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8160 (SS160 PIERCE)
G90G00W-.165
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8161 (SS160 FAST)
G82P4000Q500R100F110.0
G88P130M54 (13.0KG)
G87P-3
G181R35
G04X0.5
G135
M99
```

```
O8166 (SS160 LEADIN)
G82P4000Q500R100F30.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.180" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.180 U-0.160

Servo Pierce	Step			
8180	1	2	3	4
Focus (inch)	-0.160			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8181	8182	8183	103
Feed (ipm)	90-115	50	30	75
Focus (inch)	-0.160	-0.160	-0.160	-0.160
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8186
Feed (ipm)	15
Focus (inch)	-0.160
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8180 (SS180 PIERCE)
G90G00W-.160
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8181 (SS180 FAST)
G82P4000Q500R100F90.0
G88P90M54 (9.0KG)
G87P-3
G181R35
G04X0.5
G135
M99
```

```
O8186 (SS180 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.250" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.250 U-0.195

Servo Pierce	Step			
8250	1	2	3	4
Focus (inch)	-0.195			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8251	8252	8253	103
Feed (ipm)	62-70	40	20	75
Focus (inch)	-0.195	-0.195	-0.195	-0.195
Power (w)	4000	2200	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8256
Feed (ipm)	10
Focus (inch)	-0.195
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8250 (SS250 PIERCE)
G90G00W-0.195
G88P10M58
G87P30
G82P2500Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8251 (SS250 FAST)
G82P4000Q500R100F62.0
G88P90M54 (9.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O8256 (SS250 LEADIN)
G82P4000Q500R100F10.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.320" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.320 U-0.230

Servo Pierce	Step			
8320	1	2	3	4
Focus (inch)	-0.230			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	40			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8321	8322	8323	103
Feed (ipm)	45-53	32	32	75
Focus (inch)	-0.230	-0.230	-0.230	-0.230
Power (w)	4000	3000	3000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8326
Feed (ipm)	7
Focus (inch)	-0.230
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8320 (SS320 PIERCE)
G90G00W-0.230
G88P10M58
G87P40
M32
G82P4000Q500R100
M20
M22
G04X0.4
G87P5
G90G00W[#994/25.4]
M99
```

```
O8321 (SS320 FAST)
G82P4000Q500R100F45.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O8326 (SS320 LEADIN)
G82P4000Q500R100F7.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.320 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.035 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.380" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.380 U-0.320

Servo Pierce	Step			
8380	1	2	3	4
Focus (inch)	-0.320			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.5			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8381	8382	8383	103
Feed (ipm)	33-36	24	24	75
Focus (inch)	-0.320	-0.320	-0.320	-0.320
Power (w)	4000	2800	2800	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	120	120	120	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8386
Feed (ipm)	7
Focus (inch)	-0.320
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8380 (SS380 PIERCE)
G90G00W-0.320
G88P10M58
G87P50
M32
G82P4000Q500R100
M20
M22
G04X0.5
G90G00W[#994/25.4]
M99
```

```
O8381 (SS380 FAST)
G82P4000Q500R100F33.0
G88P120M54 (12.0KG)
G87P-5
G04X0.5
G135
M99
```

```
O8386 (SS380 LEADIN)
G82P4000Q500R100F7.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.380 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.500" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.500 U-0.500

Servo Pierce	Step			
8500	1	2	3	4
Focus (inch)	-0.400	-0.650	-0.500	
Feedrate (inch)	-	100	-	
Power (W)	4000	4000	4000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	15	15	100	
Gas Type	M58	M58	M58	
Gas Pressure (G88P)	10	10	10	
Nozzle Gap (G87P)	60	60	10	
Dwell (sec)	0.5	-	0.5	

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8501	8502	8503	103
Feed (ipm)	16-18	13	13	75
Focus (inch)	-0.500	-0.500	-0.500	-0.500
Power (w)	4000	4000	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	140	140	140	10
Nozzle Gap (G87P)	-4	0	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8506
Feed (ipm)	3
Focus (inch)	-0.500
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	10
Dwell (sec)	0

Sample Code

```
O8500 (SS500 PIERCE)
G90G00W-0.400
G88P10M58
G87P60
M32
G82P4000Q500R15
M20
M22
G04X0.5
G90G01W-0.650F100
G82P4000Q500R100
G90G00W[#994/25.4]
G87P10
G04X0.5
M99
```

```
O8501 (SS500 FAST)
G82P4000Q500R100F16.0
G88P140M54 (14.0KG)
G87P-4
G04X0.5
G135
M99
```

```
O8506 (SS500 LEADIN)
G82P4000Q500R100F3.0
G88P50M58
G87P10
M99
```

Programming Suggestions

Lead-in Length : 0.500 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.050 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency. Use a 4mm nozzle to improve edge quality. Parts may contain spots of dross.

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Material Cut Table

Aluminum *(Nitrogen)*

Material Type: *5052*
Thickness Range: *0.040” to 0.375”*
Assist Gas: *Nitrogen*
Focus Lens: *7.5 Inch*
Data Set: *FMS Setup*

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0.040" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I3 J0.036 U-0.060

Servo Pierce	Step			
7040	1	2	3	4
Focus (inch)	-0.060			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast* 7041	*Medium* 7042	*Slow* 7043	*Etch*
Feed (ipm)	425-500	200	100	*Not Recommended*
Focus (inch)	-0.060	-0.060	-0.060	
Power (w)	4000	2000	200	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	0	0	0	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.1	0.1	0.1	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7040 (AL040 PIERCE)
G90G00W-0.060
G88P10M58
G87P10
G82P2500Q500R100
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7041 (AL040 FAST)
G82P4000Q500R100F425.0
G88P70M54 (7.0KG)
G87P0
G181R45
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.050" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I3 J0.048 U-0.060

Servo Pierce	Step			
7050	1	2	3	4
Focus (inch)	-0.060			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast* 7051	*Medium* 7052	*Slow* 7053	*Etch*
Feed (ipm)	370-445	200	100	*Not Recommended*
Focus (inch)	-0.060	-0.060	-0.060	
Power (w)	4000	2000	2000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	0	0	0	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.1	0.1	0.1	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7050 (AL050 PIERCE)
G90G00W-0.060
G88P10M58
G87P10
G82P2500Q500R100
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7051 (AL050 FAST)
G82P4000Q500R100F370.0
G88P70M54 (7.0KG)
G87P0
G181R45
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.060" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.060 U-0.060

Servo Pierce	Step			
7060	1	2	3	4
Focus (inch)	-0.060			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	7061	7062	7063	
Feed (ipm)	320-370	190	100	*Not Recommended*
Focus (inch)	-0.060	-0.060	-0.060	
Power (w)	4000	2000	2000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M58	M58	M58	
Gas Pressure (G88P)	50	50	50	
Nozzle Gap (G87P)	0	0	0	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.1	0.1	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7060 (AL060 PIERCE)
G90G00W-0.060
G88P10M58
G87P10
G82P2500Q500R100
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7061 (AL060 FAST)
G82P4000Q500R100F320.0
G88P50M58
G87P0
G181R45
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.080" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.080 U-0.090

Servo Pierce	Step			
7080	1	2	3	4
Focus (inch)	-0.090			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	7081	7082	7083	
Feed (ipm)	260-310	140	80	*Not Recommended*
Focus (inch)	-0.090	-0.090	-0.090	
Power (w)	4000	2000	2000	
Frequency (Hz)	500	500	200	
Duty Cycle (%)	100	100	85	
Gas Type	M58	M58	M58	
Gas Pressure (G88P)	60	60	60	
Nozzle Gap (G87P)	0	0	-3	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7080 (AL080 PIERCE)
G90G00W-0.090
G88P10M58
G87P10
G82P2500Q500R100
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7081 (AL080 FAST)
G82P4000Q500R100F260.0
G88P60M58
G87P0
G181R45
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.090" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.090 U-0.100

Servo Pierce	Step			
7090	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast* 7091	*Medium* 7092	*Slow* 7093	*Etch*
Feed (ipm)	230-300	130	75	*Not Recommended*
Focus (inch)	-0.100	-0.100	-0.100	
Power (w)	4000	2000	2000	
Frequency (Hz)	500	500	200	
Duty Cycle (%)	100	100	85	
Gas Type	M58	M58	M58	
Gas Pressure (G88P)	60	60	60	
Nozzle Gap (G87P)	0	0	-3	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7090 (AL090 PIERCE)
G90G00W-0.100
G88P10M58
G87P10
G82P2500Q500R100
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7091 (AL090 FAST)
G82P4000Q500R100F230.0
G88P60M58
G87P0
G181R45
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.100" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.105 U-0.100

Servo Pierce	Step			
7100	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	7101	7102	7103	
Feed (ipm)	200-260	120	70	*Not Recommended*
Focus (inch)	-0.100	-0.100	-0.100	
Power (w)	4000	2500	2000	
Frequency (Hz)	500	500	200	
Duty Cycle (%)	100	100	85	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	0	0	-4	
Ramping (G181R)	45	45	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7100 (AL105 PIERCE)
G90G00W-0.100
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7101 (AL105 FAST)
G82P4000Q500R100F200.0
G88P70M54 (7.0Kg)
G87P0
G181R45
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.120" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.120 U-0.120

Servo Pierce	Step			
7120	1	2	3	4
Focus (inch)	-0.120			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast* 7121	*Medium* 7122	*Slow* 7123	*Etch*
Feed (ipm)	130-150	90	50	*Not Recommended*
Focus (inch)	-0.120	-0.120	-0.120	
Power (w)	4000	2500	1500	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	80	80	80	
Nozzle Gap (G87P)	-4	-4	-4	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin* 7126
Feed (ipm)	75
Focus (inch)	-0.120
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7120 (AL120 PIERCE)
G90G00W-0.120
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7121 (AL120 FAST)
G82P4000Q500R100F130.0
G88P80M54 (8.0KG)
G87P-4
G04X0.2
M99
```

```
O7126 (AL120 LEADIN)
G82P4000Q500R100F75.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast cutting parameters.

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Unauthorized Distribution Prohibited

0.160" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.160 U-0.190

Servo Pierce	Step			
7160	1	2	3	4
Focus (inch)	-0.190			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast* 7161	*Medium* 7162	*Slow* 7163	*Etch*
Feed (ipm)	80-100	60	25	*Not Recommended*
Focus (inch)	-0.190	-0.190	-0.190	
Power (w)	4000	3000	2000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	90	90	90	
Nozzle Gap (G87P)	-4	-4	-4	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin* 7166
Feed (ipm)	35
Focus (inch)	-0.190
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7160 (AL160 PIERCE)
G90G00W-0.190
G88P10M58
G87P20
G82P4000Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O7161 (AL160 FAST)
G82P4000Q500R100F80.0
G88P90M54 (9.0KG)
G87P-4
G04X0.2
G135
M99

O7166 (AL160 LEADIN)
G82P4000Q500R100F35.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast or Medium cutting parameters.

Confidential Material
Unauthorized Distribution Prohibited

0.180" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.180 U-0.240

Servo Pierce	Step			
7180	1	2	3	4
Focus (inch)	-0.240			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast* 7181	*Medium* 7182	*Slow* 7183	*Etch*
Feed (ipm)	60-68	40	20	*Not Recommended*
Focus (inch)	-0.240	-0.240	-0.240	
Power (w)	4000	3000	2500	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	110	110	110	
Nozzle Gap (G87P)	-4	0	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.3	0.3	0.3	

Acceleration	*Leadin* 7186
Feed (ipm)	30
Focus (inch)	-0.240
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7180 (AL180 PIERCE)
G90G00W-0.240
G88P10M58
G87P30
G82P2500Q30R15
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O7181 (AL180 FAST)
G82P4000Q500R100F60
G88P110M54 (11.0KG)
G87P-4
G04X0.3
G135
M99
```

```
O7186 (SS180 LEADIN)
G82P4000Q500R100F30.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast or Medium cutting parameters.

Confidential Material
Unauthorized Distribution Prohibited

0.250" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.250 U-0.350

Servo Pierce	Step			
7250	1	2	3	4
Focus (inch)	-0.350			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	60			
Dwell (sec)	0.8			

Cut	*Fast* 7251	*Medium* 7252	*Slow* 7253	*Etch*
Feed (ipm)	35-40	15	15	*Not Recommended*
Focus (inch)	-0.350	-0.350	-0.350	
Power (w)	4000	3000	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	110	110	110	
Nozzle Gap (G87P)	-4	-5	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7256
Feed (ipm)	15
Focus (inch)	-0.350
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7250 (AL250 PIERCE)
G90G00W-0.350
G88P10M58
G87P60
M32
G82P4000Q500R100
M20
M22
G04X0.8
G90G00W[#994/25.4]
M99
```

```
O7251 (AL250 FAST)
G82P4000Q500R100F35
G88P110M54 (11.0KG)
G87P-4
G04X0.5
G135
M99
```

```
O7256 (AL250 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.320" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.320 U-0.390

Servo Pierce	Step			
7320	1	2	3	4
Focus (inch)	-0.390			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	60			
Dwell (sec)	1.0			

Cut	*Fast* 7321	*Medium* 7322	*Slow* 7323	*Etch*
Feed (ipm)	25-30	12	12	*Not Recommended*
Focus (inch)	-0.390	-0.390	-0.390	
Power (w)	4000	3000	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	120	120	120	
Nozzle Gap (G87P)	-4	-5	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7326
Feed (ipm)	12
Focus (inch)	-0.390
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7320 (AL320 PIERCE)
G90G00W-0.390
G88P10M58
G87P60
M32
G82P4000Q500R100
M20
M22
G04X1.0
G90G00W[#994/25.4]
M99
```

```
O7321 (AL320 FAST)
G82P4000Q500R100F25.0
G88P120M54 (12.0KG)
G87P-4
G04X0.5
G135
M99
```

```
O7326 (AL320 LEADIN)
G82P4000Q500R100F12.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.320 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.035 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.380" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.380 U-0.435

Servo Pierce	Step			
7380	1	2	3	4
Focus (inch)	-0.435			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	60			
Dwell (sec)	1.2			

Cut	*Fast* 7381	*Medium* 7382	*Slow* 7383	*Etch*
Feed (ipm)	15-20	8	8	*Not Recommended*
Focus (inch)	-0.435	-0.435	-0.435	
Power (w)	4000	3500	3500	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	140	140	140	
Nozzle Gap (G87P)	-4	-5	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7386
Feed (ipm)	8
Focus (inch)	-0.435
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7380 (AL380 PIERCE)
G90G00W-0.435
G88P10M58
G87P60
M32
G82P4000Q500R100
M20
M22
G04X1.2
G90G00W[#994/25.4]
M99
```

```
O7381 (AL380 FAST)
G82P4000Q500R100F15
G88P140M54 (14.0KG)
G87P-4
G04X0.5
G135
M99
```

```
O7386 (AL380 LEADIN)
G82P4000Q500R100F8.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.380 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Material Cut Table

Mild Steel *(Oxygen)*

Material Type: *CRS/HR-A36*
Thickness Range: *0.036” to 1.00”*
Assist Gas: *Oxygen*
Focus Lens: *5.0 Inch & 7.5 Inch*
Data Set: *Optimum Setup*

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0.036" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1 J0.036 U-0.040

Servo Pierce	Step			
5040	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5041	5042	5043	101
Feed (ipm)	265-320	135	55	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1200	600	1500	500
Frequency (Hz)	500	500	120	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	20	20	25	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5040 (MS040 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5041 (MS040 FAST)
G82P1200Q500R100F265.0
G88P20M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.048" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1J0.048 U-0.040

Servo Pierce	Step			
5050	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5051	5052	5053	101
Feed (ipm)	230-275	110	40	75
Focus (inch)	-0.04	-0.04	-0.04	-0.040
Power (w)	1200	800	1500	500
Frequency (Hz)	500	500	300	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	20	20	25	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5050 (MS050 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5051 (MS050 FAST)
G82P1200Q500R100F230.0
G88P20M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.060" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1J0.060 U-0.040

Servo Pierce	Step			
5060	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5061	5062	5063	101
Feed (ipm)	205-260	90	40	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1200	600	1500	500
Frequency (Hz)	500	500	300	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	20	20	25	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5060 (MS060 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5061 (MS060 FAST)
G82P1200Q500R100F205.0
G88P20M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.080" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1J0.080 U-0.040

Servo Pierce	Step			
5080	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5081	5082	5083	101
Feed (ipm)	180-240	85	40	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	800	1500	500
Frequency (Hz)	500	500	300	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	35	35	35	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5080 (MS080 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5081 (MS080 FAST)
G82P1000Q500R100F180.0
G88P35M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.090" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1J0.090 U-0.040

Servo Pierce	Step			
5090	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5091	5092	5093	101
Feed (ipm)	160-220	80	35	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	600	1500	500
Frequency (Hz)	500	500	300	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	35	35	35	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5090 (MS090 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5091 (MS090 FAST)
G82P1000Q500R100F160.0
G88P35M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.105" Mild Steel oxygen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I1J0.105 U-0.040

Servo Pierce	Step			
5100	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5101	5102	5013	101
Feed (ipm)	145-175	75	35	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	1000	600	1500	500
Frequency (Hz)	500	500	300	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	50	50	50	10
Nozzle Gap (G87P)	0	0	0	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5100 (MS105 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5101 (MS105 FAST)
G82P1000Q500R100F145.0
G88P50M56
G87P0
G181R35
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.120" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1J0.120 U-0.040

Servo Pierce	Step			
5120	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5121	5122	5123	101
Feed (ipm)	135-165	65	35	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	2500	1000	1500	500
Frequency (Hz)	500	500	150	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5120 (MS120 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5121 (MS120 FAST)
G82P2500Q500R100F135.0
G88P04M56
G87P5
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.135" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1J0.135 U0.00

Servo Pierce	Step			
5140	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5141	5142	5143	101
Feed (ipm)	125-160	60	30	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	3300	1000	1500	500
Frequency (Hz)	500	500	150	125
Duty Cycle (%)	100	100	45	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0	0	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5140 (MS140 PIERCE)
G90G00W-0.100
G88P8M56
G87P20
M32
G82P1500Q20R20
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O5141 (MS140 FAST)
G82P3300Q500R100F125.0
G88P4M56
G87P5
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.160" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1J0.160 U0.00

Servo Pierce	Step			
5160	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	15			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	7			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5161	5162	5163	101
Feed (ipm)	115-150	90	30	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	3800	1000	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	10	10	10
Nozzle Gap (G87P)	5	0	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5160 (MS160 PIERCE)
G90G00W-0.100
G88P7M56
G87P20
M32
G82P2000Q15R20
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O5161 (MS160 FAST)
G82P3800Q500R100F115.0
G88P04M56
G87P5
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.180" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1J0.180 U0.00

Servo Pierce	Step			
5180	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	15			
Duty Cycle (%)	20			
Gas Type	M56			
Gas Pressure (G88P)	7			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5181	5182	5183	101
Feed (ipm)	110-145	60	25	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1000	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	5	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5180 (MS180 PIERCE)
G90G00W-0.100
G88P7M56
G87P20
M32
G82P2000Q15R20
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O5181 (MS180 FAST)
G82P4000Q500R100F110.0
G88P4M56
G87P5
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner radius: 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.250" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z1.5 W2 I1J0.250 U0.00

Servo Pierce	Step			
5250	1	2	3	4
Focus (inch)	-0.160			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	15			
Duty Cycle (%)	30			
Gas Type	M56			
Gas Pressure (G88P)	6			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5251	5252	5253	101
Feed (ipm)	95-115	50	20	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1200	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	8	8	10
Nozzle Gap (G87P)	10	10	10	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5250 (MS250 PIERCE)
G90G00W-0.160
G88P6M56
G87P30
M32
G82P2500Q15R30
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O5251 (MS250 FAST)
G82P4000Q500R100F95.0
G88P4M56
G87P10
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.2 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.2 seconds
Corner radius: 0.025 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

Confidential Material
Unauthorized Distribution Prohibited

0.320" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z2.0 W3 I1J0.320 U0.00

Servo Pierce	Step			
5320	1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	-0.020
Feedrate (inch)	-	26	-	-
Power (W)	2500	2500	2500	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	15	22	22	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.3	(0.1)	2.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5321	5322	5323	101
Feed (ipm)	80-95	45	15	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1500	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	7	8	8	10
Nozzle Gap (G87P)	10	5	5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5320 (MS320 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P2500Q10R15
M20
M22
G04X0.3
G87P20
G88P4M56
G82P2500Q100R22
G90G01W-.160F26.0
G124P2
G04X2.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5321 (MS320 FAST)
G82P4000Q500R100F80
G88P7M56
G87P10
G04X0.3
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.3 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.3 seconds
Corner radius: 0.035 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.380" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z2.0 W3 I1J0.380 U0.00

Servo Pierce	Step			
5380	1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	-0.020
Feedrate (inch)	-	15	-	-
Power (W)	2500	2500	2500	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	15	22	22	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.5	(0.2)	3.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5381	5382	5383	101
Feed (ipm)	68-78	40	10	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	1500	2500	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	6	6	6	10
Nozzle Gap (G87P)	10	10	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5380 (MS380 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P2500Q10R15
M20
M22
G04X0.5
G87P20
G88P4M56
G82P2500Q100R22
G90G01W-.160F15.0
G124P2
G04X3.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5381 (MS380 FAST)
G82P4000Q500R100F68
G88P6M56
G87P10
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.150 inch or greater
Dwell at end of Lead-in : 0.3 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.3 seconds
Corner radius: 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.500" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z2.0 W3 I1J0.500 U0.00

Servo Pierce 5500	Step 1	2	3	4
Focus (inch)	-0.120	-0.160	-0.160	0.020
Feedrate (inch)	-	8	-	-
Power (W)	3000	3000	3000	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	20	34	34	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	40	20	20	20
Dwell (sec)	0.8	(0.3)	5.0	0.2

Cut	*Fast* 5501	*Medium* 5502	*Slow* 5503	*Etch* 101
Feed (ipm)	48-58	38	8	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	4000	2000	2500	500
Frequency (Hz)	500	500	30	125
Duty Cycle (%)	100	100	30	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	7	7	8	10
Nozzle Gap (G87P)	10	10	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O5500 (MS500 PIERCE)
G90G00W-0.120
G88P4M56
G87P40
M32
G82P3000Q10R20
M20
M22
G04X0.8
G87P20
G88P4M56
G124P2
G82P3000Q100R34
G90G01W-.160F8.0
G04X5.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5501 (MS500 FAST)
G82P4000Q500R100F48
G88P7M56
G87P10
G04X0.5
G135
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : 0.5 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.5 seconds
Corner radius: 0.050 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Required

Comments: Holes 5/8" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.630" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z3.0 W3 I1J0.630 U0.00

Servo Pierce 5630	Step 1	2	3	4
Focus (inch)	-0.120	-0.200	-0.200	0.040
Feedrate (inch)	-	4	-	-
Power (W)	3000	3000	3000	2500
Frequency (Hz)	10	100	100	30
Duty Cycle (%)	20	36	36	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	5	5	5
Nozzle Gap (G87P)	60	20	20	20
Dwell (sec)	1.0	(1.2)	5.0	0.2

Cut	*Fast* 5631	*Medium* 5632	*Slow* 5633	*Etch* 101
Feed (ipm)	32-36	28	7	75
Focus (inch)	0.000	0.000	0.000	0.000
Power (w)	3800	2500	4000	500
Frequency (Hz)	500	500	50	125
Duty Cycle (%)	100	100	40	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	5	5	4	10
Nozzle Gap (G87P)	10	10	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin* 5636
Feed (ipm)	5
Focus (inch)	0.000
Power (w)	4000
Frequency (Hz)	30
Duty Cycle (%)	50
Gas Type	M56
Gas Pressure (G88P)	6
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O5630 (MS630 PIERCE)
G90G00W-0.120
G88P4M56
G87P60
M32
G82P3000Q10R20
M20
M22
G04X1.0
G87P20
G88P5M56
G124P2
G82P3000Q100R36
G90G01W-.200F4.0
G04X5.0
G125
M23
G90G00W[#994/25.4]
G82P2500Q30R30
M22
G04X0.2
M99
```

```
O5631 (MS630 FAST)
G82P3800Q500R100F34.0
G88P5M56
G87P10
M32
M22
G04X0.5
G135
M99
```

```
O5636 (MS630 LEADIN)
G82P4000Q30R50F5.0
G88P6M56
G87P20
M32
M22
M99
```

Programming Suggestions

Lead-in Length : 0.300 inch or greater
Dwell at end of Lead-in : 0.7 seconds
Exact Stops : Not Needed
Corner cooling dwell : 0.7 seconds
Corner radius: 0.065 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required

Comments: Holes 3/4" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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0.750" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z3.0 W3 I1J0.750 U0.020

Servo Pierce	Step			
5750	1	2	3	4
Focus (inch)	-0.120	-0.200	-0.200	0.040
Feedrate (inch)	-	4	-	-
Power (W)	3300	3500	3500	3500
Frequency (Hz)	12	80	80	30
Duty Cycle (%)	20	33	33	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	60	20	20	20
Dwell (sec)	1.0	(1.2)	8.0	0.2

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5751	5752	5753	101
Feed (ipm)	28-36	24	2	75
Focus (inch)	0.020	0.020	0.020	0.020
Power (w)	3800	2500	3000	500
Frequency (Hz)	500	500	20	125
Duty Cycle (%)	100	100	35	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	5	5	4	10
Nozzle Gap (G87P)	10	10	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	5756
Feed (ipm)	5
Focus (inch)	0.020
Power (w)	4000
Frequency (Hz)	30
Duty Cycle (%)	50
Gas Type	M56
Gas Pressure (G88P)	6
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O5750 (MS750 PIERCE)
G90G00W-0.120
G88P4M56
G87P60
M32
G82P3300Q12R20
M20
M22
G04X1.0
G87P20
G88P4M56
G124P2
G82P3500Q80R33
G90G01W-.20F4.0
G04X8.0
G125
M23
G90G00W[#994/25.4]
G82P3500Q30R30
M22
G04X0.2
M99
```

```
O5751 (MS750 FAST)
G82P3800Q500R100F28.0
G88P5M56
G87P10
M32
M22
G04X0.5
G135
M99
```

```
O5756 (MS750 LEADIN)
G82P4000Q30R50F5.0
G88P6M56
G87P20
M32
M22
M99
```

Programming Suggestions

Lead-in Length : 0.300 inch or greater
Dwell at end of Lead-in : 1.0 second
Exact Stops : Not Needed
Corner cooling dwell : 1.0 second
Corner radius: 0.075 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required

Comments: Holes 1.0" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel.

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1.00" Mild Steel oxygen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	DBL

Machine Setup Command

G22 T7.5 Z3.0 W3 I1J1.00 U0.020

Servo Pierce	Step			
5990	1	2	3	4
Focus (inch)	-0.120	-0.200	-0.200	0.040
Feedrate (inch)	-	1	-	-
Power (W)	3300	3500	3500	3500
Frequency (Hz)	12	80	80	30
Duty Cycle (%)	20	33	33	30
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	4	4	4	4
Nozzle Gap (G87P)	60	20	20	20
Dwell (sec)	1.0	(4.8)	14.0	0.2

Side Blow Pierce	*Pierce*
	5999
Focus (inch)	-0.100
Oil Mist (sec)	0.4
Power (w)	4000
Frequency (Hz)	75
Duty Cycle (%)	95
Gas Type	M56
Gas Pressure (G88P)	8
Nozzle Gap (G87P)	60
Side Blow (sec)	2.0
Dwell (sec)	3.0

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	5991	5992	5993	101
Feed (ipm)	20-24	16	2	75
Focus (inch)	0.020	0.020	0.020	0.020
Power (w)	3800	3200	4000	500
Frequency (Hz)	500	500	20	125
Duty Cycle (%)	100	100	40	3
Gas Type	M56	M56	M56	M56
Gas Pressure (G88P)	5	5	4	10
Nozzle Gap (G87P)	10	10	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.8	0.8	0.8	0

Acceleration	*Leadin*
	5996
Feed (ipm)	2
Focus (inch)	0.020
Power (w)	4000
Frequency (Hz)	30
Duty Cycle (%)	50
Gas Type	M56
Gas Pressure (G88P)	5
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O5990 (MS1000 PIERCE)
G90G00W-0.120
G88P4M56
G87P60
M32
G82P3300Q12R20
M20
M22
G04X1.0
G87P20
G88P4M56
G124P2
G82P3500Q80R33
G90G01W-.20F1.0
G04X14.0
G125
M23
G90G00W[#994/25.4]
G82P3500Q30R30
M22
G04X0.2
M99
```

```
O5999 (MS1000 Side Blow)
G90G00W-0.100
G87P60
M32
G88P8M56
M31
M66
G04X0.4
M65
G82P4000Q75R95
M22
G04X3.0
M23
M60
G04X2.0
M61
M22
M32
G90G00W[#994/24.5]
M99

O5991 (MS1000 FAST)
G82P3800Q500R100F20.0
G88P5M56
G87P10
M32
M22
G04X0.8
G135
M99
```

Programming Suggestions

Lead-in Length : 1.00 inch or greater
Dwell at end of Lead-in : 1.5 seconds
Exact Stops : Not Needed
Corner cooling dwell : 1.5 seconds
Corner radius: 0.100 inch
Accelerated Start of Cut : Required
Double cut lead-in : Required
Pre-Pierce: Recommended

Comments: Holes 1.25" diameter and smaller should use a medium or slow cut condition to minimize the amount of heat applied to the steel. Pre-Piercing with a 1.5mm nozzle will produce a smaller Side Blow pierce. Good quality laser grade steel improves consistency.

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Material Cut Table

Mild Steel *(Nitrogen)*

Material Type: *CRS*
Thickness Range: *0.036” to 0.250”*
Assist Gas: *Nitrogen*
Focus Lens: *5.0 Inch & 7.5 Inch*
Data Set: *Optimum Setup*

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0.036" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I2 J0.036 U-0.050

Servo Pierce	Step			
6040	1	2	3	4
Focus (inch)	-0.050			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6041	6042	6043	103
Feed (ipm)	375-440	200	85	75
Focus (inch)	-0.050	-0.050	-0.050	-0.050
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	25	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	75	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6040 (MS060 PIERCE)
G90G00W-0.050
G88P15M58
G87P10
G82P1500Q30R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O6041 (MS060 FAST)
G82P4000Q500R100F375.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.048" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I2 J0.048 U-0.050

Servo Pierce	Step			
6050	1	2	3	4
Focus (inch)	-0.050			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6051	6052	6053	103
Feed (ipm)	315-370	150	75	75
Focus (inch)	-0.050	-0.050	-0.050	-0.050
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	30	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6050 (MS060 PIERCE)
G90G00W-0.050
G88P15M58
G87P10
G82P1500Q30R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O6051 (MS060 FAST)
G82P4000Q500R100F315.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.060" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I2 J0.060 U-0.070

Servo Pierce	Step			
6060	1	2	3	4
Focus (inch)	-0.070			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6061	6062	6063	103
Feed (ipm)	270-320	135	65	75
Focus (inch)	-0.070	-0.070	-0.070	-0.070
Power (w)	4000	2000	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	30	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6060 (MS060 PIERCE)
G90G00W-0.070
G88P15M58
G87P10
G82P1500Q30R20
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O6061 (MS060 FAST)
G82P4000Q500R100F270.0
G88P110M54 (11.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.080" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.080 U-0.070

Servo Pierce	Step			
6080	1	2	3	4
Focus (inch)	-0.070			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	15			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6081	6082	6083	103
Feed (ipm)	225-250	105	55	75
Focus (inch)	-0.070	-0.070	-0.070	-0.070
Power (w)	4000	2000	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6080 (MS080 PIERCE)
G90G00W-0.070
G88P15M58
G87P15
G82P2000Q30R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6081 (MS080 FAST)
G82P4000Q500R100F225.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.090" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.090 U-0.085

Servo Pierce	Step			
6090	1	2	3	4
Focus (inch)	-0.085			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	15			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6091	6092	6093	103
Feed (ipm)	195-245	85	40	75
Focus (inch)	-0.085	-0.085	-0.085	-0.085
Power (w)	4000	2000	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6090 (MS090 PIERCE)
G90G00W-0.085
G88P15M58
G87P15
G82P2000Q30R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6091 (MS090 FAST)
G82P4000Q500R100F195.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.105" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.105 U-0.085

Servo Pierce	Step			
6100	1	2	3	4
Focus (inch)	-0.085			
Feedrate (inch)	-			
Power (W)	2000			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6101	6102	6103	103
Feed (ipm)	175-230	85	40	75
Focus (inch)	-0.085	-0.085	-0.085	-0.085
Power (w)	4000	2000	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6100 (MS105 PIERCE)
G90G00W-0.085
G88P15M58
G87P20
G82P2000Q30R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6101 (MS105 FAST)
G82P4000Q500R100F175.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.120" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.120 U-0.085

Servo Pierce	Step			
6120	1	2	3	4
Focus (inch)	-0.085			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	30			
Duty Cycle (%)	20			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6121	6122	6123	103
Feed (ipm)	155-200	80	40	75
Focus (inch)	-0.085	-0.085	-0.085	-0.085
Power (w)	4000	2000	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6120 (MS120 PIERCE)
G90G00W-0.085
G88P15M58
G87P20
G82P2500Q30R20
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O6121 (MS120 FAST)
G82P4000Q500R100F155.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.135" Mild Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.135 U-0.110

Servo Pierce	Step			
6140	1	2	3	4
Focus (inch)	-0.110			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	30			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6141	6142	6143	103
Feed (ipm)	130-160	75	35	75
Focus (inch)	-0.110	-0.110	-0.110	-0.110
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.3	0.3	0.3	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O6140 (MS140 PIERCE)
G90G00W-0.110
G88P15M58
G87P20
G82P2500Q30R30
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6141 (MS140 FAST)
G82P4000Q500R100F130.0
G88P90M54 (9.0KG)
G87P0
G181R25
G04X0.3
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.160" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.160 U-0.125

Servo Pierce	Step			
6160	1	2	3	4
Focus (inch)	-0.200			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	5			
Duty Cycle (%)	55			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6161	6162	6163	103
Feed (ipm)	100-115	65	55	75
Focus (inch)	-0.125	-0.125	-0.125	-0.125
Power (w)	4000	2500	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.4	0.4	0.4	0

Acceleration	*Leadin*
	6166
Feed (ipm)	15
Focus (inch)	-0.125
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6160 (MS160 PIERCE)
G90G00W-.200
G88P8M58
G87P30
M32
G82P4000Q5R55
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6161 (MS160 FAST)
G82P4000Q500R100F100.0
G88P100M54 (10.0KG)
G87P-3
G181R25
G04X0.4
G135
M99
```

```
O6166 (MS160 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.180" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.180 U-0.140

Servo Pierce 6180	Step 1	2	3	4
Focus (inch)	-0.250			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	30			
Duty Cycle (%)	25			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast* 6181	*Medium* 6182	*Slow* 6183	*Etch* 103
Feed (ipm)	72-85	55	55	75
Focus (inch)	-0.140	-0.140	-0.140	-0.140
Power (w)	4000	3700	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin* 6186
Feed (ipm)	15
Focus (inch)	-0.140
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6180 (MS180 PIERCE)
G90G00W-.250
G88P8M58
G87P30
G82P4000Q30R25
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O6181 (MS180 FAST)
G82P4000Q500R100F72.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O6186 (MS180 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.250" Mild Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.250 U-0.235

Servo Pierce	Step			
6250	1	2	3	4
Focus (inch)	-0.325			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	5			
Duty Cycle (%)	55			
Gas Type	M58			
Gas Pressure (G88P)	8			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.4			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	6251	6252	6253	103
Feed (ipm)	48-55	40	10	75
Focus (inch)	-0.235	-0.235	-0.235	0.000
Power (w)	4000	3700	3700	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	120	120	120	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.8	0.8	0.8	0

Acceleration	*Leadin*
	6256
Feed (ipm)	10
Focus (inch)	-0.235
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O6250 (MS250 PIERCE)
G90G00W-.325
G88P8M58
G87P30
M32
G82P4000Q5R55
M20
M22
G04X0.4
G90G00W[#994/25.4]
M99
```

```
O6251 (MS250 FAST)
G82P4000Q500R100F48.0
G88P120M54 (12.0KG)
G87P-3
G04X0.8
G135
M99
```

```
O6256 (MS250 LEADIN)
G82P4000Q500R100F10.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Material Cut Table

Stainless Steel *(Nitrogen)*

Material Type: *304*
Thickness Range: *0.036” to 0.500”*
Assist Gas: *Nitrogen*
Focus Lens: *5.0 Inch & 7.5 Inch*
Data Set: *Optimum Setup*

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0.036" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I2 J0.036 U-0.040

Servo Pierce	Step			
8040	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8041	8042	8043	103
Feed (ipm)	375-440	180	80	75
Focus (inch)	-0.040	-0.040	-0.040	-0.060
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	40	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8040 (SS040 PIERCE)
G90G00W-0.040
G88P15M58
G87P10
G82P1500Q20R30
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8041 (SS040 FAST)
G82P4000Q500R100F375.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.048" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I2 J0.048 U-0.040

Servo Pierce	Step			
8050	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8051	8052	8053	103
Feed (ipm)	315-375	150	70	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	40	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8050 (SS050 PIERCE)
G90G00W-0.040
G88P15M58
G87P10
G82P1500Q20R30
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8051 (SS050 FAST)
G82P4000Q500R100F315.0
G88P100M54 (10.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.060" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.060 U-0.040

Servo Pierce	Step			
8060	1	2	3	4
Focus (inch)	-0.040			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8061	8062	8063	103
Feed (ipm)	265-310	115	70	75
Focus (inch)	-0.040	-0.040	-0.040	-0.040
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8060 (SS060 PIERCE)
G90G00W-0.040
G88P15M58
G87P10
G82P1500Q20R30
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8061 (SS060 FAST)
G82P4000Q500R100F265.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.080" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.080 U-0.085

Servo Pierce	Step			
8080	1	2	3	4
Focus (inch)	-0.085			
Feedrate (inch)	-			
Power (W)	1500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	10			
Dwell (sec)	0.1			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8081	8082	8083	103
Feed (ipm)	230-275	115	60	75
Focus (inch)	-0.085	-0.085	-0.085	-0.085
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	80	80	80	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.1	0.1	0.1	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8080 (SS080 PIERCE)
G90G00W-0.040
G88P15M58
G87P10
G82P1500Q20R30
M32
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O8081 (SS080 FAST)
G82P4000Q500R100F230.0
G88P80M54 (8.0KG)
G87P-3
G181R25
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.090" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.090 U-0.090

Servo Pierce	Step			
8090	1	2	3	4
Focus (inch)	-0.090			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8091	8092	8093	103
Feed (ipm)	200-235	100	55	75
Focus (inch)	-0.090	-0.090	-0.090	-0.090
Power (w)	4000	2500	3000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O8090 (SS090 PIERCE)
G90G00W-0.090
G88P15M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99

O8091 (SS090 FAST)
G82P4000Q500R100F200.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.105" Stainless Steel nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I2 J0.105 U-0.100

Servo Pierce	Step			
8100	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8101	8102	8103	103
Feed (ipm)	175-215	85	55	75
Focus (inch)	-0.100	-0.100	-0.100	-0.100
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

O8100 (SS105 PIERCE)
G90G00W-0.100
G88P15M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99

O8101 (SS105 FAST)
G82P4000Q500R100F175.0
G88P90M54 (9.0KG)
G87P-3
G181R25
G04X0.2
M99

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.120" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.120 U-0.150

Servo Pierce	Step			
8120	1	2	3	4
Focus (inch)	-0.150			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8121	8122	8123	103
Feed (ipm)	155-190	80	50	75
Focus (inch)	-0.150	-0.150	-0.150	-0.150
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8120 (SS120 PIERCE)
G90G00W-0.150
G88P15M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O8121 (SS120 FAST)
G82P4000Q500R100F155.0
G88P100M54 (10.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.135" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.135 U-0.150

Servo Pierce	Step			
8140	1	2	3	4
Focus (inch)	-0.150			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	20			
Duty Cycle (%)	30			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8141	8142	8143	103
Feed (ipm)	135-160	70	45	75
Focus (inch)	-0.150	-0.150	-0.150	-0.150
Power (w)	4000	2500	4000	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	50	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	100	100	100	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	25	25	(off)	(off)
Dwell (sec)	0.2	0.2	0.2	0

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O8140 (SS140 PIERCE)
G90G00W-0.150
G88P10M58
G87P20
G82P2500Q20R30
M32
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O8141 (SS140 FAST)
G82P4000Q500R100F135.0
G88P100M54 (10.0KG)
G87P-3
G181R25
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.140 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.160" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I2 J0.160 U-0.165

Servo Pierce	Step			
8160	1	2	3	4
Focus (inch)	-0.165			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8161	8162	8163	103
Feed (ipm)	110-130	55	35	75
Focus (inch)	-0.165	-0.165	-0.165	-0.125
Power (w)	4000	2500	2800	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	130	130	130	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8166
Feed (ipm)	30
Focus (inch)	-0.165
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8160 (SS160 PIERCE)
G90G00W-0.165
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8161 (SS160 FAST)
G82P4000Q500R100F110.0
G88P130M54 (13.0KG)
G87P-3
G181R35
G04X0.5
G135
M99
```

```
O8166 (SS160 LEADIN)
G82P4000Q500R100F30.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.180" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.180 U-0.150

Servo Pierce	Step			
8180	1	2	3	4
Focus (inch)	-0.150			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8181	8182	8183	103
Feed (ipm)	90-115	45	25	75
Focus (inch)	-0.150	-0.150	-0.150	-0.150
Power (w)	4000	2500	2500	500
Frequency (Hz)	500	500	1500	125
Duty Cycle (%)	100	100	35	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	90	90	90	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	35	35	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8186
Feed (ipm)	15
Focus (inch)	-0.150
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8180 (SS180 PIERCE)
G90G00W-0.150
G88P10M58
G87P20
G82P2500Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8181 (SS180 FAST)
G82P4000Q500R100F90.0
G88P90M54 (9.0KG)
G87P-3
G181R35
G04X0.5
G135
M99
```

```
O8186 (SS180 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.250" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.250 U-0.150

Servo Pierce	Step			
8250	1	2	3	4
Focus (inch)	-0.150			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	30			
Dwell (sec)	0.3			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8251	8252	8253	103
Feed (ipm)	65-75	45	45	75
Focus (inch)	-0.150	-0.150	-0.150	-0.150
Power (w)	4000	3000	3000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8256
Feed (ipm)	10
Focus (inch)	-0.150
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8250 (SS250 PIERCE)
G90G00W-0.150
G88P10M58
G87P30
G82P3000Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O8251 (SS250 FAST)
G82P4000Q500R100F65.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O8256 (SS250 LEADIN)
G82P4000Q500R100F10.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.320" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.320 U-0.230

Servo Pierce	Step			
8320	1	2	3	4
Focus (inch)	-0.230			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	40			
Dwell (sec)	0.4			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8321	8322	8323	103
Feed (ipm)	45-52	32	32	75
Focus (inch)	-0.230	-0.230	-0.230	-0.230
Power (w)	4000	3000	3000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	110	110	110	10
Nozzle Gap (G87P)	-3	-3	-3	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8326
Feed (ipm)	7
Focus (inch)	-0.230
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8320 (SS320 PIERCE)
G90G00W-0.230
G88P10M58
G87P40
M32
G82P4000Q500R100
M20
M22
G04X0.4
G90G00W[#994/25.4]
M99
```

```
O8321 (SS320 FAST)
G82P4000Q500R100F45.0
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O8326 (SS320 LEADIN)
G82P4000Q500R100F7.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.320 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.035 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.380" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.380 U-0.320

Servo Pierce	Step			
8380	1	2	3	4
Focus (inch)	-0.320			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.5			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8381	8382	8383	103
Feed (ipm)	33-36	24	24	75
Focus (inch)	-0.320	-0.320	-0.320	-0.320
Power (w)	4000	2800	2800	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	120	120	120	10
Nozzle Gap (G87P)	-5	-5	-5	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8386
Feed (ipm)	5
Focus (inch)	-0.320
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	30
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O8380 (SS380 PIERCE)
G90G00W-0.320
G88P10M58
G87P50
G82P4000Q500R100
M32
M20
M22
G04X0.5
G90G00W[#994/25.4]
M99
```

```
O8381 (SS380 FAST)
G82P4000Q500R100F33.0
G88P120M54 (12.0KG)
G87P-5
G04X0.5
G135
M99
```

```
O8386 (SS380 LEADIN)
G82P4000Q500R100F5.0
G88P30M58
G87P5
M32
M99
```

Programming Suggestions

Lead-in Length : 0.380 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
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0.500" Stainless Steel nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I2 J0.500 U-0.500

Servo Pierce	Step			
8500	1	2	3	4
Focus (inch)	-0.400	-0.650	-0.500	
Feedrate (inch)	-	100	-	
Power (W)	4000	4000	4000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	15	15	100	
Gas Type	M58	M58	M58	
Gas Pressure (G88P)	10	10	10	
Nozzle Gap (G87P)	60	60	10	
Dwell (sec)	0.5	-	0.5	

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	8501	8502	8503	103
Feed (ipm)	16-18	13	13	75
Focus (inch)	-0.500	-0.500	-0.500	-0.500
Power (w)	4000	4000	4000	500
Frequency (Hz)	500	500	500	125
Duty Cycle (%)	100	100	100	3
Gas Type	M54	M54	M54	M58
Gas Pressure (G88P)	140	140	140	10
Nozzle Gap (G87P)	-4	0	0	20
Ramping (G181R)	(off)	(off)	(off)	(off)
Dwell (sec)	0.5	0.5	0.5	0

Acceleration	*Leadin*
	8506
Feed (ipm)	3
Focus (inch)	-0.500
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	10
Dwell (sec)	0

Sample Code

```
O8500 (SS500 PIERCE)
G90G00W-0.400
G88P10M58
G87P60
M32
G82P4000Q500R15
M20
M22
G04X0.5
G90G01W-0.650F100
G82P4000Q500R100
G90G00W[#994/25.4]
G87P10
G04X0.5
G90
M99
```

```
O8501 (SS500 FAST)
G82P4000Q500R100F16.0
G88P140M54 (14.0KG)
G87P-4
G04X0.5
G135
M99
```

```
O8506 (SS500 LEADIN)
G82P4000Q500R100F3.0
G88P50M58
G87P10
M32
M99
```

Programming Suggestions

Lead-in Length : 0.500 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.050 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency. Use a 4mm nozzle to improve edge quality. Parts may contain spots of dross.

Confidential Material
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Material Cut Table

Aluminum *(Nitrogen)*

Material Type: *5052*
Thickness Range: *0.040” to 0.375”*
Assist Gas: *Nitrogen*
Focus Lens: *5.0 Inch & 7.5 Inch*
Data Set: *Optimum Setup*

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Confidential Material
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0.040" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I3 J0.04 U-0.080

Servo Pierce	Step			
7040	1	2	3	4
Focus (inch)	-0.080			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	15			
Dwell (sec)	0.1			

Cut	*Fast* 7041	*Medium* 7042	*Slow* 7043	*Etch*
Feed (ipm)	475-550	225	100	*Not Recommended*
Focus (inch)	-0.080	-0.080	-0.080	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	55	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	-3	-3	-3	
Ramping (G181R)	35	35	(off)	
Dwell (sec)	0.1	0.1	0.1	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7040 (AL040 PIERCE)
G90G00W-0.080
G88P15M58
G87P15
M32
G82P2500Q500R100
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7041 (AL040 FAST)
G82P4000Q500R100F475.0
G88P70M54 (7.0KG)
G87P-3
G181R35
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.050" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I3 J0.048 U-0.090

Servo Pierce	Step			
7050	1	2	3	4
Focus (inch)	-0.090			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	15			
Dwell (sec)	0.1			

Cut	*Fast* 7051	*Medium* 7052	*Slow* 7053	*Etch*
Feed (ipm)	375-440	185	90	*Not Recommended*
Focus (inch)	-0.090	-0.090	-0.090	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	65	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	90	
Nozzle Gap (G87P)	-3	-3	-3	
Ramping (G181R)	35	35	(off)	
Dwell (sec)	0.1	0.1	0.1	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7050 (AL050 PIERCE)
G90G00W-0.090
G88P15M58
G87P15
M32
G82P2500Q500R100
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7051 (AL050 FAST)
G82P4000Q500R100F375.0
G88P70M54 (7.0KG)
G87P-3
G181R35
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/2" diameter and smaller should use a medium or slow cut condition to improve consistency.

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Unauthorized Distribution Prohibited

0.060" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	1.5
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z1.5 W2 I3 J0.060 U-0.100

Servo Pierce	Step			
7060	1	2	3	4
Focus (inch)	-0.100			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.1			

Cut	*Fast* 7061	*Medium* 7062	*Slow* 7063	*Etch*
Feed (ipm)	310-365	160	80	*Not Recommended*
Focus (inch)	-0.100	-0.100	-0.100	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	65	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	-3	-3	-3	
Ramping (G181R)	35	35	(off)	
Dwell (sec)	0.1	0.1	0.1	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7060 (AL060 PIERCE)
G90G00W-0.100
G88P15M58
G87P20
M32
G82P2500Q500R100
M20
M22
G04X0.1
G90G00W[#994/25.4]
M99
```

```
O7061 (AL060 FAST)
G82P4000Q500R100F310.0
G88P70M54 (7.0KG)
G87P-3
G181R35
G04X0.1
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.080" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I3 J0.080 U-0.110

Servo Pierce	Step			
7080	1	2	3	4
Focus (inch)	-0.110			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast*	*Medium*	*Slow*	*Etch*
	7081	7082	7083	
Feed (ipm)	230-270	130	60	*Not Recommended*
Focus (inch)	-0.110	-0.110	-0.110	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	60	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	-3	-3	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7080 (AL080 PIERCE)
G90G00W-0.110
G88P15M58
G87P20
M32
G82P2500Q500R100
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7081 (AL080 FAST)
G82P4000Q500R100F230.0
G88P70M54 (7.0KG)
G87P-3
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.090" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I3 J0.090 U-0.125

Servo Pierce	Step			
7090	1	2	3	4
Focus (inch)	-0.125			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast* 7091	*Medium* 7092	*Slow* 7093	*Etch*
Feed (ipm)	200-235	100	40	*Not Recommended*
Focus (inch)	-0.125	-0.125	-0.125	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	60	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	-3	-3	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7090 (AL090 PIERCE)
G90G00W-0.125
G88P15M58
G87P20
M32
G82P2500Q500R100
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7091 (AL090 FAST)
G82P4000Q500R100F200.0
G88P70M54 (7.0KG)
G87P-3
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.015 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 5/16" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.100" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I3 J0.100 U-0.125

Servo Pierce	Step			
7100	1	2	3	4
Focus (inch)	-0.125			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast* 7101	*Medium* 7102	*Slow* 7103	*Etch*
Feed (ipm)	170-200	90	35	*Not Recommended*
Focus (inch)	-0.125	-0.125	-0.125	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	60	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	70	70	70	
Nozzle Gap (G87P)	-3	-3	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin*
Feed (ipm)	
Focus (inch)	
Power (w)	
Frequency (Hz)	
Duty Cycle (%)	
Gas Type	
Gas Pressure (G88P)	
Nozzle Gap (G87P)	
Dwell (sec)	

Sample Code

```
O7100 (AL105 PIERCE)
G90G00W-0.125
G88P15M58
G87P20
M32
G82P2500Q500R100
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7101 (AL105 FAST)
G82P4000Q500R100F170.0
G88P70M54 (7.0KG)
G87P-3
G04X0.2
M99
```

Programming Suggestions

Lead-in Length : 0.100 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Not Needed
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency.

Confidential Material
Unauthorized Distribution Prohibited

0.120" Aluminum nitrogen assist

Focus Lens (inch)	5.0
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T5.0 Z2.0 W2 I3 J0.120 U-0.130

Servo Pierce 7120	Step 1	2	3	4
Focus (inch)	-0.130			
Feedrate (inch)	-			
Power (W)	2500			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	15			
Nozzle Gap (G87P)	20			
Dwell (sec)	0.2			

Cut	*Fast* 7121	*Medium* 7122	*Slow* 7123	*Etch*
Feed (ipm)	125-150	80	30	*Not Recommended*
Focus (inch)	-0.130	-0.130	-0.130	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	60	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	80	80	80	
Nozzle Gap (G87P)	-3	-3	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin* 7126
Feed (ipm)	75
Focus (inch)	-0.130
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	5
Dwell (sec)	0

Sample Code

```
O7120 (AL120 PIERCE)
G90G00W-0.130
G88P15M58
G87P20
M32
G82P2500Q500R100
M20
M22
G04X0.2
G90G00W[#994/25.4]
M99
```

```
O7121 (AL120 FAST)
G82P4000Q500R100F125.0
G88P80M54 (8.0KG)
G87P-3
G04X0.2
M99

O7126 (AL120 LEADIN)
G82P40000Q500R100F75.0
G88P50M58
G87P5
M99
```

Programming Suggestions

Lead-in Length : 0.120 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Use 140 degree and under
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast cutting parameters.

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Unauthorized Distribution Prohibited

0.160" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.160 U-0.195

Servo Pierce	Step			
7160	1	2	3	4
Focus (inch)	-0.195			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.3			

Cut	*Fast* 7161	*Medium* 7162	*Slow* 7163	*Etch*
Feed (ipm)	80-110	60	25	*Not Recommended*
Focus (inch)	-0.195	-0.195	-0.195	
Power (w)	4000	2800	1500	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	100	100	100	
Nozzle Gap (G87P)	-3	-3	-3	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.2	0.2	0.2	

Acceleration	*Leadin* 7166
Feed (ipm)	35
Focus (inch)	-0.195
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7160 (AL160 PIERCE)
G90G00W-0.195
G88P10M58
G87P50
G82P4000Q500R100
M32
M20
M22
G04X0.3
G90G00W[#994/25.4]
M99
```

```
O7161 (AL160 FAST)
G82P4000Q500R100F80
G88P100M54 (10.0KG)
G87P-3
G04X0.2
G135
M99

O7166 (AL160 LEADIN)
G82P4000Q500R100F35.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.160 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 1/4" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast or Medium cutting parameters.

Confidential Material
Unauthorized Distribution Prohibited

0.180" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	2.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z2.0 W2 I3 J0.180 U-0.245

Servo Pierce	Step			
7180	1	2	3	4
Focus (inch)	-0.245			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.5			

Cut	*Fast* 7181	*Medium* 7182	*Slow* 7183	*Etch*
Feed (ipm)	58-62	40	20	*Not Recommended*
Focus (inch)	-0.245	-0.245	-0.245	
Power (w)	4000	2800	2000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	120	120	120	
Nozzle Gap (G87P)	-3	0	0	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.3	0.3	0.3	

Acceleration	*Leadin* 7186
Feed (ipm)	30
Focus (inch)	-0.245
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7180 (AL180 PIERCE)
G90G00W-0.245
G88P10M58
G87P50
G82P4000Q500R100
M32
M20
M22
G04X0.5
G90G00W[#994/25.4]
M99
```

```
O7181 (AL180 FAST)
G82P4000Q500R100F58
G88P120M54 (12.0KG)
G87P-3
G04X0.3
G135
M99
```

```
O7186 (SS180 LEADIN)
G82P4000Q500R100F30.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.180 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.020 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency. Accelerated leadin needed only when using the Fast or Medium cutting parameters.

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0.250" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I3 J0.250 U-0.360

Servo Pierce	Step			
7250	1	2	3	4
Focus (inch)	-0.240			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.5			

Cut	*Fast* 7251	*Medium* 7252	*Slow* 7253	*Etch*
Feed (ipm)	35-42	20	15	*Not Recommended*
Focus (inch)	-0.360	-0.360	-0.360	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	90	90	90	
Nozzle Gap (G87P)	-3	-4	5	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7256
Feed (ipm)	15
Focus (inch)	-0.360
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7250 (AL250 PIERCE)
G90G00W-0.240
G88P10M58
G87P50
M32
G82P4000Q500R100
M20
M22
G04X0.5
G90G00W[#994/25.4]
M99
```

```
O7251 (AL250 FAST)
G82P4000Q500R100F35
G88P90M54 (9.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O7256 (AL250 LEADIN)
G82P4000Q500R100F15.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.250 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.025 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.320" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I3 J0.320 U-0.410

Servo Pierce	Step			
7320	1	2	3	4
Focus (inch)	-0.240			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	0.8			

Cut	*Fast* 7321	*Medium* 7322	*Slow* 7323	*Etch*
Feed (ipm)	25-30	12	8	*Not Recommended*
Focus (inch)	-0.410	-0.410	-0.410	
Power (w)	4000	2500	3000	
Frequency (Hz)	500	500	200	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	100	100	100	
Nozzle Gap (G87P)	-3	-4	5	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7326
Feed (ipm)	8
Focus (inch)	-0.410
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7320 (AL320 PIERCE)
G90G00W-0.240
G88P10M58
G87P50
M32
G82P4000Q500R100
M20
M22
G04X0.8
G90G00W[#994/25.4]
M99
```

```
O7321 (AL320 FAST)
G82P4000Q500R100F25
G88P100M54 (10.0KG)
G87P-3
G04X0.5
G135
M99
```

```
O7326 (AL320 LEADIN)
G82P4000Q500R100F8.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.320 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.035 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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0.380" Aluminum nitrogen assist

Focus Lens (inch)	7.5
Nozzle Diameter (mm)	3.0
Nozzle Type	STD

Machine Setup Command

G22 T7.5 Z3.0 W2 I3 J0.380 U-0.460

Servo Pierce	Step			
7380	1	2	3	4
Focus (inch)	-0.240			
Feedrate (inch)	-			
Power (W)	4000			
Frequency (Hz)	500			
Duty Cycle (%)	100			
Gas Type	M58			
Gas Pressure (G88P)	10			
Nozzle Gap (G87P)	50			
Dwell (sec)	1.2			

Cut	*Fast* 7381	*Medium* 7382	*Slow* 7383	*Etch*
Feed (ipm)	15-20	6	6	*Not Recommended*
Focus (inch)	-0.460	-0.460	-0.460	
Power (w)	4000	4000	4000	
Frequency (Hz)	500	500	500	
Duty Cycle (%)	100	100	100	
Gas Type	M54	M54	M54	
Gas Pressure (G88P)	110	110	110	
Nozzle Gap (G87P)	-3	15	15	
Ramping (G181R)	(off)	(off)	(off)	
Dwell (sec)	0.5	0.5	0.5	

Acceleration	*Leadin* 7386
Feed (ipm)	8
Focus (inch)	-0.460
Power (w)	4000
Frequency (Hz)	500
Duty Cycle (%)	100
Gas Type	M58
Gas Pressure (G88P)	50
Nozzle Gap (G87P)	20
Dwell (sec)	0

Sample Code

```
O7380 (AL380 PIERCE)
G90G00W-0.240
G88P10M58
G87P50
M32
G82P4000Q500R100
M20
M22
G04X1.2
G90G00W[#994/25.4]
M99
```

```
O7381 (AL380 FAST)
G82P4000Q500R100F15
G88P110M54 (11.0KG)
G87P-3
G04X0.5
G135
M99

O7386 (AL380 LEADIN)
G82P4000Q500R100F8.0
G88P50M58
G87P20
M99
```

Programming Suggestions

Lead-in Length : 0.380 inch or greater
Dwell at end of Lead-in : Not Needed
Exact Stops : Not Needed
Corner cooling dwell : Not Needed
Corner radius : 0.040 inch
Accelerated Start of Cut : Required
Double cut lead-in : Not Needed

Comments: Holes 3/8" diameter and smaller should use a medium or slow cut condition to improve consistency.

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